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CORPS OF ENGINEERS BUFFALO N Y BUFFALO DISTRICT  
RECONNAISSANCE STUDY FOR CAPE VINCENT HARBOR, NEW YORK. (U)  
APR 81 R WAXMONSKY, H GARTNER, P LUVENDER

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RECONNAISSANCE STUDY  
FOR  
CAPE VINCENT HARBOR, NEW YORK

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JUL 10 1981

U.S. Army Engineer District, Buffalo  
1776 Niagara Street  
Buffalo, NY 14207

1 April 1981

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is to determine in a preliminary manner the economic feasibility of rehabilitating the breakwater at Cape Vincent Harbor, and the environmental impact of the proposed project.

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CAPE VINCENT HARBOR RECONNAISSANCE STUDY

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## INTRODUCTION

The U.S. Army Corps of Engineers is responsible for the maintenance of general navigation channels at commercial and recreational harbors that are authorized Corps projects. Cape Vincent Harbor is an authorized Corps project and it is the responsibility of the Corps Buffalo District Office to maintain Cape Vincent Harbor.

The Corps of Engineers is required to analyze and evaluate the economic feasibility and environmental impacts associated with proposed maintenance and construction activities in an authorized harbor. Therefore, the purpose of this reconnaissance study is to determine in a preliminary manner the economic feasibility of rehabilitating the breakwater at Cape Vincent Harbor, and the environmental impact of the proposed project.

### 1. PROJECT AUTHORIZATION

The existing project, shown in Illustration 1(b), page 3, was authorized by the 1899 and 1945 River and Harbor Acts which provide for:

- a. Breakwater 1,381 feet long in the St. Lawrence River parallel to and 500 feet from the abandoned railroad wharf, 50 feet of the breakwater being a shore return arm at the upper end.
- b. A depth of 16 feet in an area approximately 17 acres behind and adjacent to the breakwater.
- c. A depth of 20 feet in an area downstream from the breakwater extending from the 16-foot project limit downstream for about 1,600 feet.

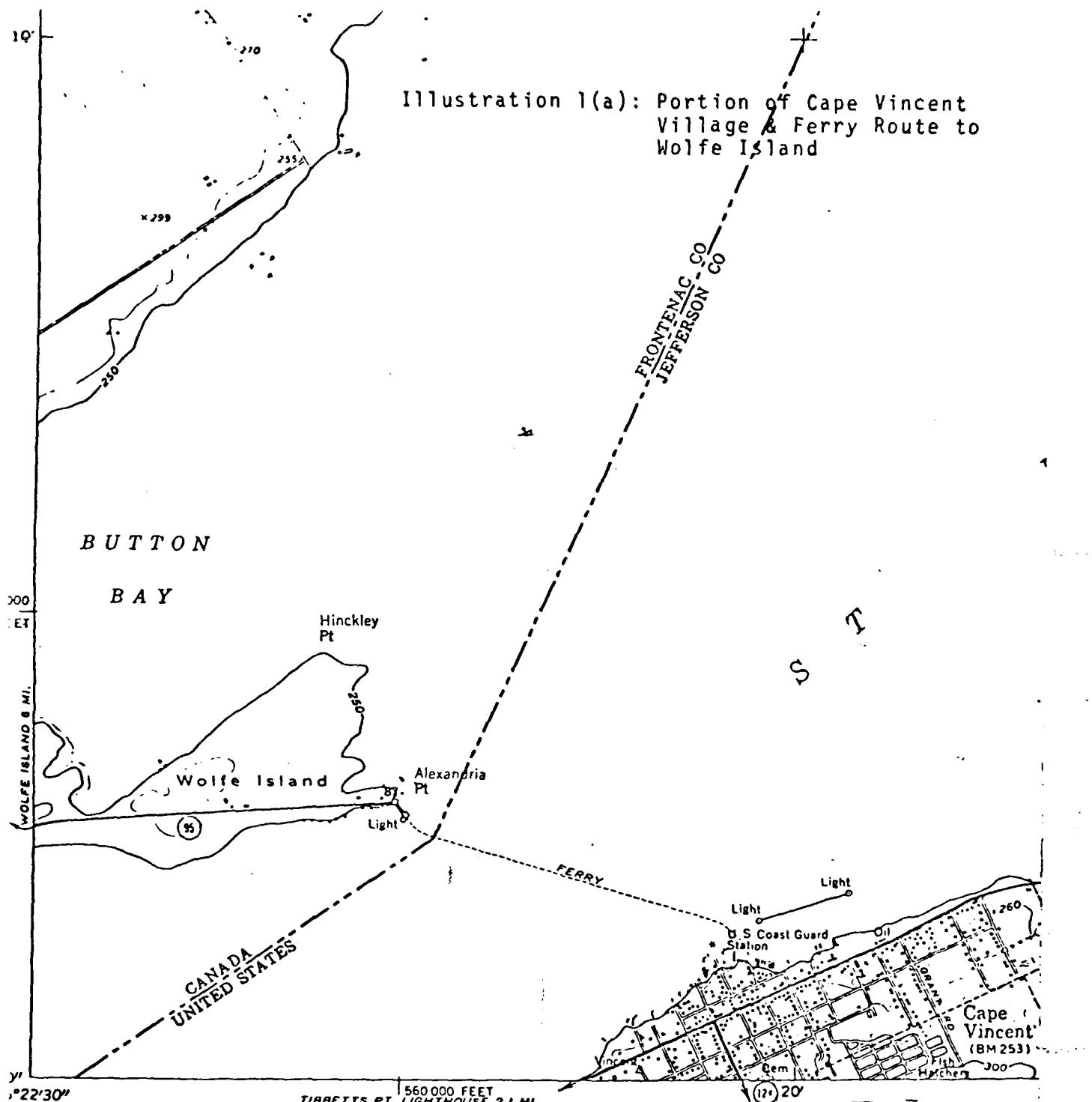
The existing project is about 71 percent complete. The work remaining to be done to complete the project is the deepening of the remainder of the 16-foot area. The remaining work is classified as deferred. Controlling depths are 16 feet in the completed portion of the 16-foot project area, and 20 feet in the 20-foot project area.

### 2. PROJECT DESCRIPTION

Cape Vincent Harbor is located in the village of Cape Vincent, Jefferson County, NY. The harbor is situated on the south shore of the St. Lawrence River, approximately 2-1/2 miles northeast of the easterly shoreline of Lake Ontario. The harbor is essentially 1 mile tangent length on the south shore of the St. Lawrence River opposite a portion of Wolfe Island (Canada). Illustration No. 1(a), page 2, shows the location of Cape Vincent Village in relation to Wolfe Island.

The breakwater is of the timber-crib type, with a concrete superstructure. Illustration No. 1(c), page 4, presents a clear and detailed description of a typical cross section of the breakwater. This includes both the timber crib and the concrete superstructure. The timber crib consists of hemlock blocks while the superstructure contains concrete blocks as well as filling stone.

Illustration 1(a): Portion of Cape Vincent Village & Ferry Route to Wolfe Island



Mapped, edited, and published by the Geological Survey.

**Control by USGS, USC&GS, U. S. Lake Survey, TVA, and International Boundary Commission**

THREE MILE BAY 8.3 MI.  
WATERTOWN 23 MI.

SCALE 1:24 000

CONTOUR INTERVAL 10 FEET IN THE UNITED STATES AND 25 FEET IN CANADA

DATUM IS MEAN SEA LEVEL

DEPTH CURVES AND SOUNDINGS IN FEET—DATUM IS LOW WATER 244 FEET

APPROXIMATE MEAN  
DECLINATION, 1958

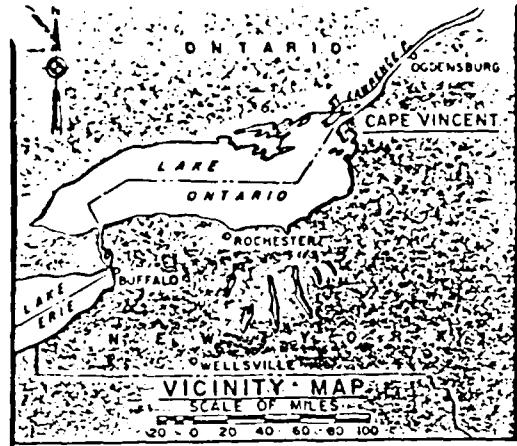


Illustration 1(b):  
Project Map

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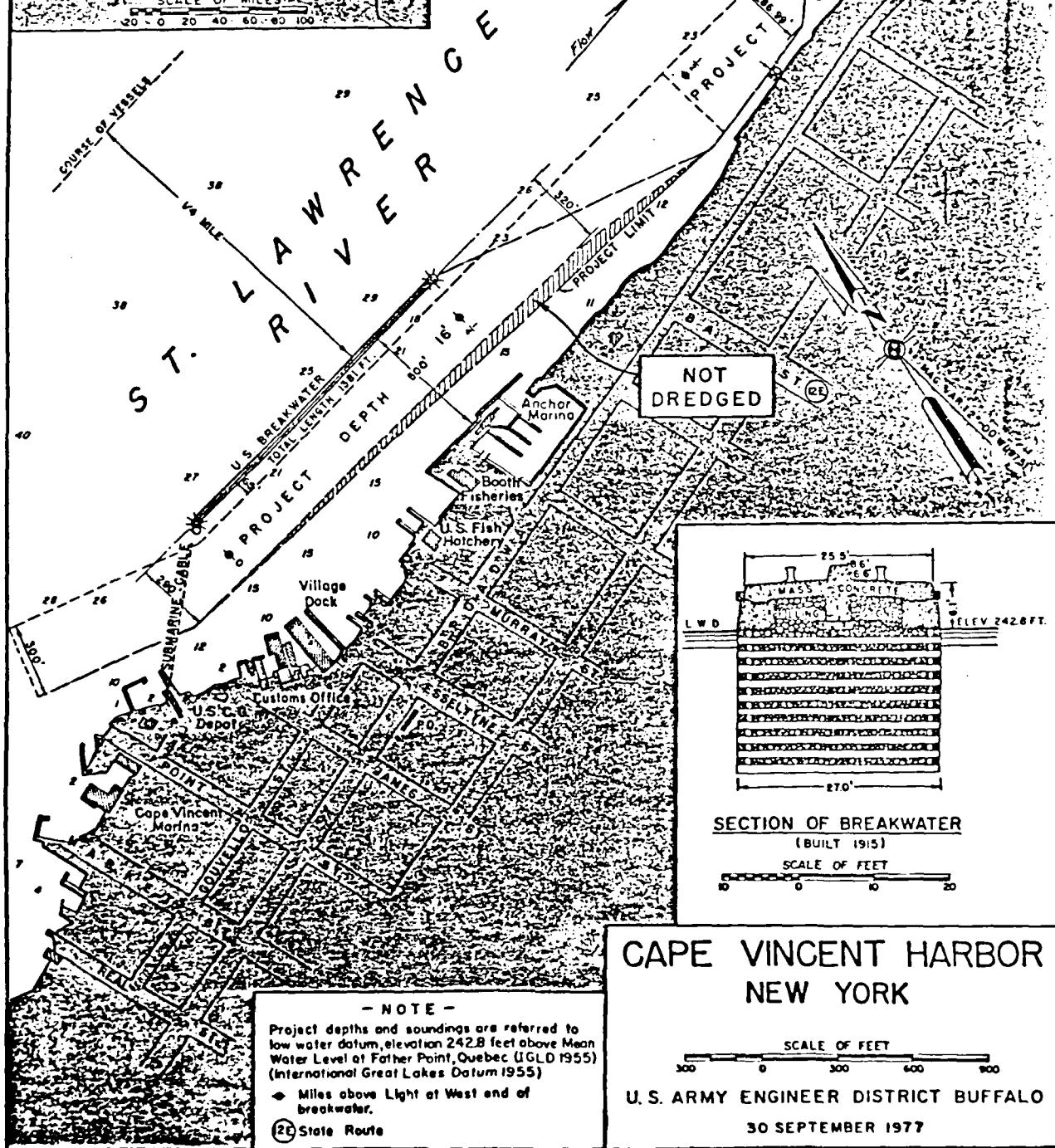
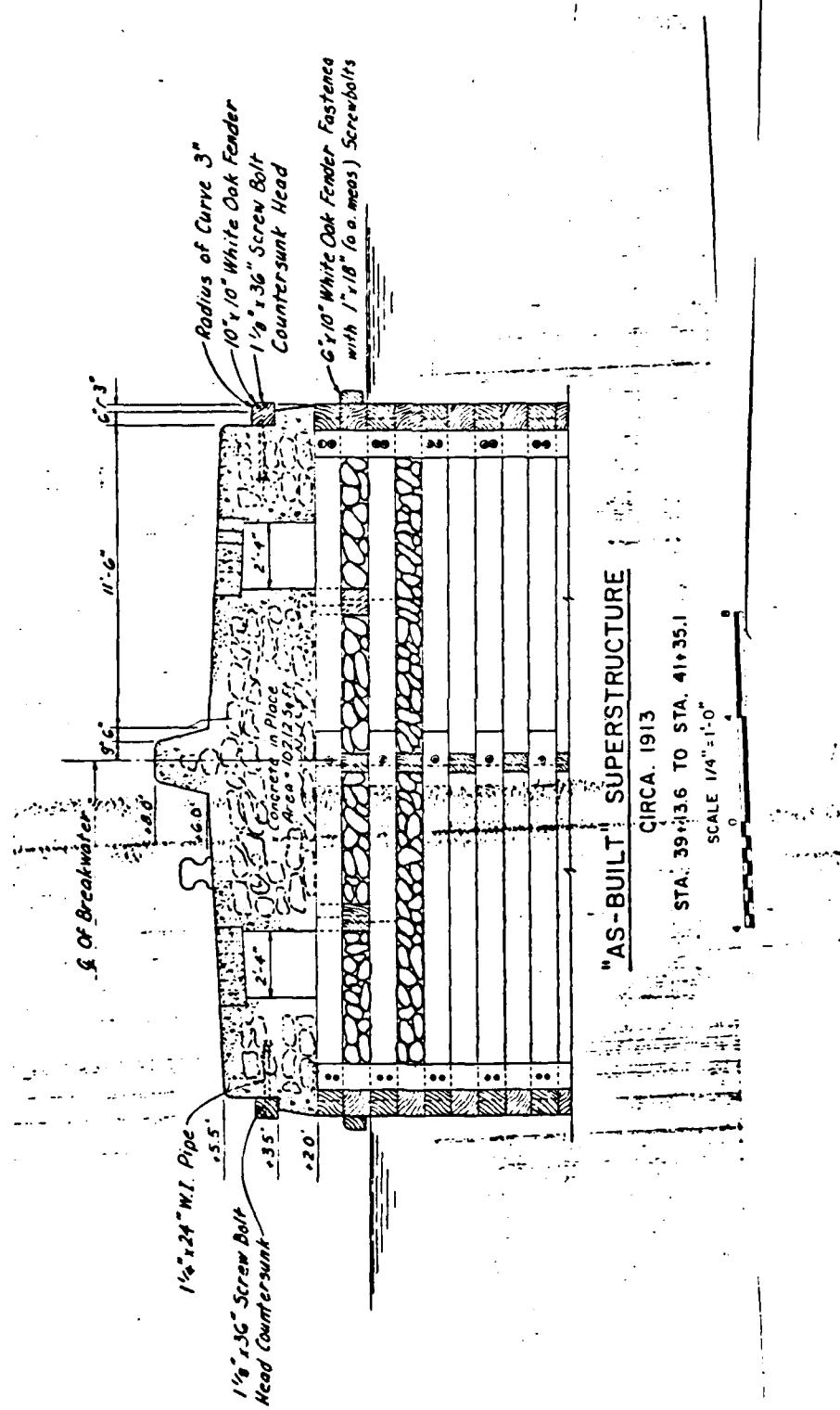


Illustration 1(c): Cape Vincent Breakwater  
Cross Section



The breakwater is lighted at both its eastern and western ends. In addition, mooring posts along the surface of the breakwater facilitate tying up boats on either side.

### 3. SERVICE AREA

As indicated in Illustration 1(d) the village of Cape Vincent (shaded area) is part of Cape Vincent Township. The village, with a total area of 1 square mile occupies 2 percent of the town's 57 square mile area. It has an estimated population of 775 according to preliminary 1980 Census figures.

Cape Vincent is essentially a resort village, with recreational boating being the major activity. In addition to recreational boating marinas, there is a New York State Department of Environmental Conservation Fisheries Research station and a small U.S. Coast Guard station. With respect to waterborne commerce, there is an automobile and passenger ferry operating seasonally between Wolfe Island, Canada, and the village. There are currently no commercial fish landings in the village of Cape Vincent. In fact, the information obtained during the reconnaissance survey suggests that the commercial fisheries in the village were closed down at the end of World War II. However, there have been commercial fish landings in the town of Cape Vincent, outside the Federal project area. A more detailed description of the service area socioeconomic demographics, waterborne commerce and similar pertinent characteristics follows.

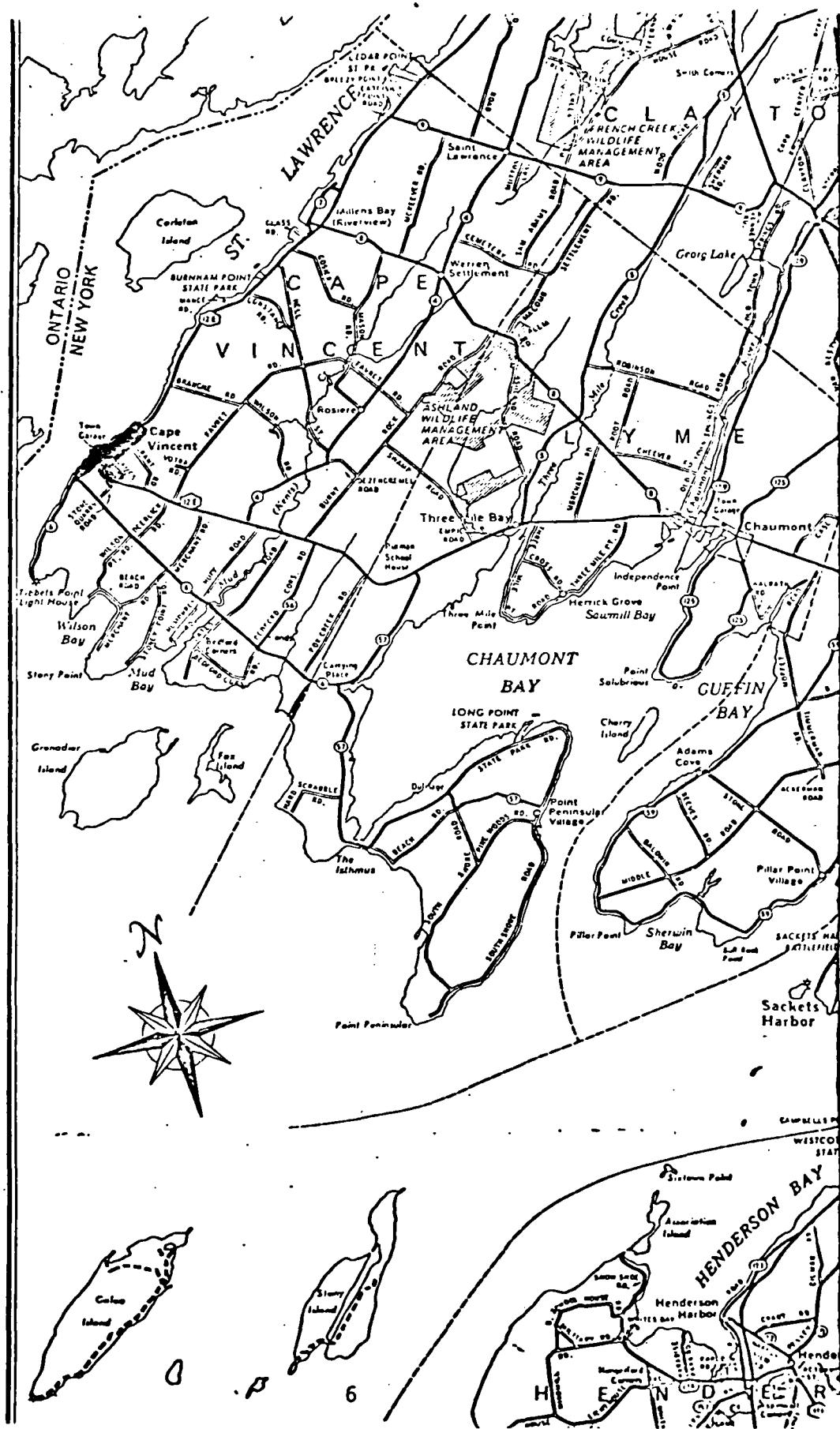
Local demographic data have been utilized wherever possible. However, some of the data have been presented on an area-wide basis in instances where up-to-date information is unavailable. Whenever data is presented for the general area, Jefferson County is the relevant political subdivision that has been used. It should be stressed that current data, when available, are invariably at the State and county levels, and are usually prepared by the County Planning Department. The information available from the New York State Department of Commerce is usually more detailed, i.e. at the town/village level. But, this information is virtually always dated (1970 Census or earlier). Current detailed data would not be available until the 1980 Census figures are published.

For purposes of this report, the variables used as socioeconomic/demographic indicators are population movements, employment and housing. This should not be interpreted as an exhaustive list. The items were chosen to present an overview.

#### a. Population

The preliminary 1980 Census count shows the population of the village of Cape Vincent as 775 persons, representing a decline of 5.5 percent since 1970. The decrease in population is due largely to the emigration of young adults who reportedly leave for college and relocate elsewhere. However,

Illustration 1(d) Cape Vincent Village in Relation to Cape Vincent Township



neither local nor county planners and politicians envision a negative impact on the marina or boating activities as a result of this out-migration. Many of the persons utilizing the harbor facilities during the regular boating season do not reside in the area on a permanent basis. Moreover, the number of seasonal visitors to the county as a whole is estimated to grow 20 percent each decade.

According to statistics made available by the Jefferson County Department of Planning<sup>1</sup>, the county's current population is approximately 85,000. Although past estimates projected a 2 percent growth in the Jefferson County population per decade (see Table 1), the preliminary 1980 Census figures show a 3.7 percent decline in the county's population from 1970. The preliminary count seems reasonable because Jefferson County has traditionally been an out-migration county. Most of those persons emigrating tend to be persons in the primary child-producing age group: 20 to 40 years old.

Table 1 - Cape Vincent and Jefferson County  
Population Projections 1970-2030

Year :	Jefferson County :	Cape Vincent Township :	Cape Vincent Village
:	:	:	:
1970 :	88,508	1,748	820
:	:	:	:
1980 :	90,187	1,725	840
:	:	:	:
1990 :	92,377	1,700	860
:	:	:	:
2000 :	94,997	1,680	880
:	:	:	:
2010 :	95,947	1,663	888
:	:	:	:
2020 :	96,906	1,646	897
:	:	:	:
2030 :	97,875	1,629	906
:	:	:	:

Source: Jefferson County Department of Planning, Population, 1973.

\*Notes: Projections for 1970-2000 reflect a 2 percent change in population. Projections for the years 2010-2030 are based on an estimate of a 1 percent growth in population per decade in Jefferson County and Cape Vincent Village; and a 1 percent decline in Cape Vincent Township.

<sup>1</sup> Most of the socioeconomic demographic data were provided by the Jefferson County Department of Planning. Documents made available included the Jefferson County Land Use Plan dated April 1978.

b. Employment

The most recent statistics available<sup>2</sup> indicate that Cape Vincent Township had a civilian labor force of 716 persons, 16 years old and over, in 1970 (Table 2). This represented 58.2 percent of the total population 16+ (1,231).<sup>3</sup> Of the total Cape Vincent labor force, in 1970, 668 persons or 93 percent were employed. This translates into an unemployment rate of 7 percent for that year. Of those employed, 49.9 percent worked for private employers, 19.2 percent for the government (Federal, State and local), 28.9 percent were self-employed and 2.1 percent were unpaid family workers.

Table 2 - Number of Employees, By Sector: Jefferson County and Town of Cape Vincent (1970)

Employment Sector	Jefferson County		Cape Vincent	
	No. of Employees	Percent	No. of Employees	Percent
Manufacturing	7,430	23.4	124	18.6
Construction	1,937	6.1	42	6.3
Transportation, Communications, and Public Utilities	2,000	6.3	16	2.4
Wholesale and Retail Trade	6,319	19.9	57	8.5
Finance, Insurance and Real Estate	1,365	4.3	38	5.7
Services and Miscellaneous	8,542	26.9	238	35.6
Public Administration	2,064	6.5	32	4.8
Total Nonfarming	29,567	93.4	547	81.9
Farming	2,096	6.6	121	18.1
Total	31,753	100.0	668	100.0

Source: New York State Department of Commerce. Business Fact Book, 1974.

<sup>2</sup> Source: New York State Department of Commerce. Business Fact Book, Part 2, 1974 Edition.

<sup>3</sup> The percentage shown in the Commerce Fact Book (51.7 percent) takes into account members of the armed forces.

A comparison of the Cape Vincent data with those for Jefferson County indicates that, at the county level 56.8 percent of the county's population 16+ were in the labor force. Of those in the labor force, 95 percent were employed - a slightly higher employment rate than Cape Vincent's 93 percent. The major differences between the county's and town's labor statistics in 1970 were found in the breakdown between private, government and self-employed persons. At the county level 70.2 percent of the workers were privately employed, as compared with 49.9 percent at the town level; 17.6 percent were employed by the government and 11.1 percent were self-employed.

The Jefferson County civilian labor force as of May 1980 was 40,500, a decline of .5 percent from the previous year's total. This figure, however, represented an increase of 2.8 percent over April 1980. The unemployment rate for May 1980 was 9.6 percent, a decline of 1.1 percent from the previous month. When compared with the unemployment rate for the previous year, this represents a 3.1 percent increase which is consistent with both national and Statewide trends.

Of the 36,600 employees in Jefferson County (as of May 1980), 30,100 or 82 percent were engaged in nonagricultural employment. Table 3 shows the number of Jefferson County employees by employment sector. The Government sector which employs approximately 20 percent of the total work force is the largest employer, with construction being the smallest (2 percent). Even though similar statistics are available for 1970 it is difficult to compare the two time periods because of the following reasons.

To begin, the 1970 figures for the government sector (6.5 percent) as shown under "public administration" in Table 3 may be misleading. As compiled by the New York State Department of Commerce, these figures do not include all employees having government as their principal employer. In fact, the government employed 17.6 percent of all workers during that time period. This percentage included not only those employed in public administration but also in the education, medical, transportation and other governmental units.

Table 3 - Number of Jefferson County Employees, By Sector  
(As of May 1980)

Employment Sector	Number of Employees	Relative Significance of Each Sector	Rank
		Percent	
Manufacturing	6,700	18.31	2
Construction	800	2.19	8
Transportation and Public Utilities	1,900	5.19	6
Wholesale and Retail Trade	6,100	16.67	4
Finance Insurance and Real Estate	1,300	3.55	7
Service and Miscellaneous	5,800	15.85	5
Government	7,500	20.49	1
Total Nonfarming	30,100	82.24	
Farming	6,500	17.76	3
Total Employees	36,600	100.00	

Source: New York State Department of Labor Division of Research and Statistics; "Labor Force and Employment Summary Watertown Area (Jefferson County)."

Note: The above data represents the most up-to-date statistics in the number of employees, at the time of the reconnaissance survey. Unfortunately, the data, while current, was not available by towns/villages. Moreover, the classification of sectors is not entirely consistent with that which was available for 1970, making direct comparisons difficult.

With respect to income levels, the median income of families in Cape Vincent Township for 1969 was \$7,955. This was 9 percent below the Jefferson County figures. In terms of the percentage of families in various income groups the town and county patterns were similar, as shown in Table 4.

Table 4 - Jefferson County and Cape Vincent Township  
Median Income of Families, 1969

		Median: No. of Families	Income Groups - Percentage of Families			
		:Income:Families:Under \$3,000:\$3,000-\$9,999:\$19-24,999:\$25,000+				
Jefferson*	:	\$ : : :	:	:	:	:
County	:	8,696 : 21,707	9.3	51.1	37.3	2.1
Cape Vincent	:	: : : :	:	:	:	:
Township	:	7,955 : 443	9.6	51.0	39.4	0
	:	: : : :	:	:	:	:

Source: New York State Department of Commerce, Business Fact Book,  
Part 2, 1974

Note: \*The Jefferson County figures do not total 100.0 percent. This, presumably, is due to the effects of rounding.

Table 5 presents the personal income per capita for New York State and Jefferson County. As indicated in the table, the county's per capita income has historically been approximately 73 to 75 percent of the per capita income for the State as a whole.

Table 5 - Per Capita Personal Income for New York State and  
Jefferson County (Current Dollars) - 1970-1977

Year	New York State	Jefferson County	Jefferson County Per Capita Income as a Percentage of New York State Income
1970	4,605	3,415	74.2
1971	4,859	3,629	74.7
1972	5,178	3,758	72.7
1973	5,561	4,108	73.9
1974	6,076	4,555	75.0
1975	6,519	4,918	74.5
1976	6,929	5,219	75.3
1977	7,519	5,650	75.1

Source: Division of the Budget, New York State Statistical Year Book 1979-1980. New York State Department of Commerce.

c. Housing

The village of Cape Vincent experienced a 22 percent increase during the 1970-1980 time period. Cape Vincent Township's housing stock increased 117 percent. Despite the overall out-migration within Jefferson County, the number of housing units increased by almost 25 percent between 1970 and 1980 (see Table 6).

Table 6 - Cape Vincent and Jefferson County Housing Stock

	1970	1980	Change (1970-1980)
	(No. of Units)	(No. of Units)	
Jefferson County	34,698	42,826	+8,128 (+ 23.4%)
Cape Vincent, Town Excludes Village	752	1,629	+ 877 (+116.6%)
Cape Vincent Village	<u>369</u>	<u>449</u>	+ <u>80 (+ 21.72%)</u>
Total Cape Vincent Township	1,121	2,178	+ 957 (+ 85.4%)

Source: Jefferson County Department of Planning (Based on Preliminary, 1980 Census Data)

Based on the 1970 Census, Cape Vincent Township had 1,121 housing units, of which 676 were year-round units. In other words, some 40 percent of the housing stock is seasonally vacant. At the county level only 15 percent of the housing stock was vacant in 1970. Approximately 81 percent of the town's year-round units were built in 1939 or earlier.

The condition of Cape Vincent's housing stock, based on the 1970 Census is satisfactory. Some 92 percent have all plumbing facilities, of which about 74 percent have central heating or built-in electric units. This compares favorably with the Jefferson County housing units, 92 percent of which have all plumbing facilities and 88 percent are equipped with central heating or built-in electrical units. The overall condition of the county's housing stock is summarized in the Jefferson County Land Use Plan, dated April 1978, which states that an estimated 16 percent of the total year-round housing stock, "possess characteristics that indicate the probability of being deficient."

A recent trend in terms of housing construction has been the development of housing in unincorporated areas just beyond city or village boundaries. Mobile homes currently comprise over 10 percent of all permanent year-round housing in the county.

d. Waterborne Commerce

As stated above, waterborne commerce at the village is limited mainly to the operations of the Wolfe Island Ferry. The tonnage of commercial fish landings shown in Table 7 relate to the town of Cape Vincent, outside the Federal project limits. Although barges and tugs do tie up at the breakwater from time to time, they neither take on nor discharge cargo. Essentially, they use the facility as a harbor-of-refuge.

Table 7 - Waterborne Commerce, Cape Vincent, NY (Town and Village)  
1967-1979

Year	Commercial Fishing		Vessel Trips: Wolfe Island Ferry		
	Commodity	Tons	Inbound	Outbound	No. of Passengers
1979	Fresh Fish	4	1,741	1,741	58,950
1978	Fresh Fish	9	1,809	1,809	66,666
1977	Fresh Fish	7	1,763	1,766	61,599
1976	Fresh Fish	6	1,781	1,780	57,606
1975	Fresh Fish	7	1,308	1,308	45,321
1974	Fresh Fish	20	1,768	1,768	58,076
1973	Fresh Fish	9	1,808	1,810	57,676
1972	Fresh Fish	N/A	1,649	1,649	53,679
1971	Fresh Fish	7	1,478	1,478	51,311
1970	Fresh Fish	N/A	1,522	1,522	55,808
1969	No Commerce Reported				
1968	No Commerce Reported				
1967	Fresh Fish	1	1,463	1,463	55,577

Source: U.S. Army Corps of Engineers, Buffalo District

Notes: (1) N/A: Not Available.

(2) The tonnage of fresh fish represent landings at the town of Cape Vincent; none are landed in the village or authorized project area.

(3) The tonnage of fish landed at Cape Vincent Township in 1979 is not currently available, but some 104,000 pounds of fresh fish landings were reported for the Chaumont Bay area from Tibets Point to Henderson Bay.

Table 7 shows the tonnage of fresh fish landings between 1967 and 1979, in the town of Cape Vincent outside the village area. The vessel trips and the number of passengers shown are for the Wolfe Island Ferry. The tonnage of fresh fish in the Cape Vincent area ranged from a low of 1 ton in 1967 to a high of 20 tons in 1974. The number of ferry passengers transported per year ranged from 51,311 in 1971 to 66,666 in 1978.

#### 4. EXISTING PHYSICAL CONDITIONS

This section of the report discusses the following: (1) problems of continued maintenance, (2) hydraulic data, (3) existing users, (4) harbor facilities, including shoreline structures, (5) obstructions and hazards to continued operation of Corps facilities.

##### a. Continued Maintenance Problems

An Environmental Assessment study relating to breakwater repairs at Cape Vincent was conducted by the Corps of Engineers in 1979. The study's report dated October 1979, indicates that the primary problem with the existing Federal project is the deterioration of the concrete cap of the breakwater superstructure. The report further states:

The crib foundation of the breakwater is still in excellent condition and in no immediate need of repair. The Federal navigation inner and approach channels were authorized and dredged to 16 and 20 feet respectively. Since initial dredging in 1945, no appreciable shoaling has occurred, and today the depths are more than sufficient for recreational craft using the harbor. In addition to the deterioration of the concrete superstructure, there are several other problems including:

a. Vessel tie-ups to the breakwater have become and will be progressively more hazardous as the superstructure deteriorates. Walking along the breakwater surface has also become somewhat dangerous, particularly during periods of adverse weather.

b. The breakwater, if allowed to deteriorate further, could become a hazard to navigation. In addition, the protection provided to shoreline marinas in Cape Vincent Harbor will be reduced if the breakwater surface is not maintained to its original dimensions.

##### b. Hydraulic (and Related) Data

The mean lake elevation is shown as 246 feet on the USGS Quadrangle Sheets.<sup>1</sup> The elevation of Cape Vincent northwest of Route 12E, and encompassing the so-called flood plain of Cape Vincent, is shown as less than 260 feet. The 250 foot contour is parallel with the shoreline and immediately inshore. Accordingly, the entire land surface area of Cape Vincent is 4 to 14 feet above the water surface of Lake Ontario.

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<sup>1</sup> On 12 September 1980 (the date of the survey), the water level was 244 feet above the mean water datum.

Lake Ontario static water level fluctuations within a typical year range from a minimum lake level in December to a maximum lake level in May and June. The range is approximately 2 feet. The hydrograph for Lake Ontario is presented in Illustration No. 1(e). The National Ocean Survey (NOS) Great Lakes Water Level Data Program is a source of comprehensive observational data.

Comparison of the Corps of Engineers, Buffalo District, NY. "Examination Soundings of 1949 and 1963," indicate the net change in this period to be  $\pm 1$  foot. Importantly, under General Notes, soundings in 1949 are referred to a Mean Low Water Datum of 243.8 feet, and in 1963 to a Mean Low Water Datum of 242.8 feet. Lack of dredging and other hydrographic data preclude more definitive findings.

While winds are variable, prevailing winds are from the west and northwest; winds from these directions predominate about 40 percent of the time. Waves and swells advancing with these winds break upon the breakwater protecting the Cape Vincent Harbor.

During the winter, ice thicknesses reputedly vary from 14 to 36 inches, particularly near the shoreline.

The relevant charts used in determining the hydraulic and related information presented in this report are as follows:

1. U.S. Geological Survey (USGS) Quadrangle

Cape Vincent North

Cape Vincent South

Scale: 1: 24,000

2. National Ocean Survey (NOS) Chart Nos.

14767 - Scale: 1: 30,000

14802 - Scale: 1: 80,000

c. Existing Users

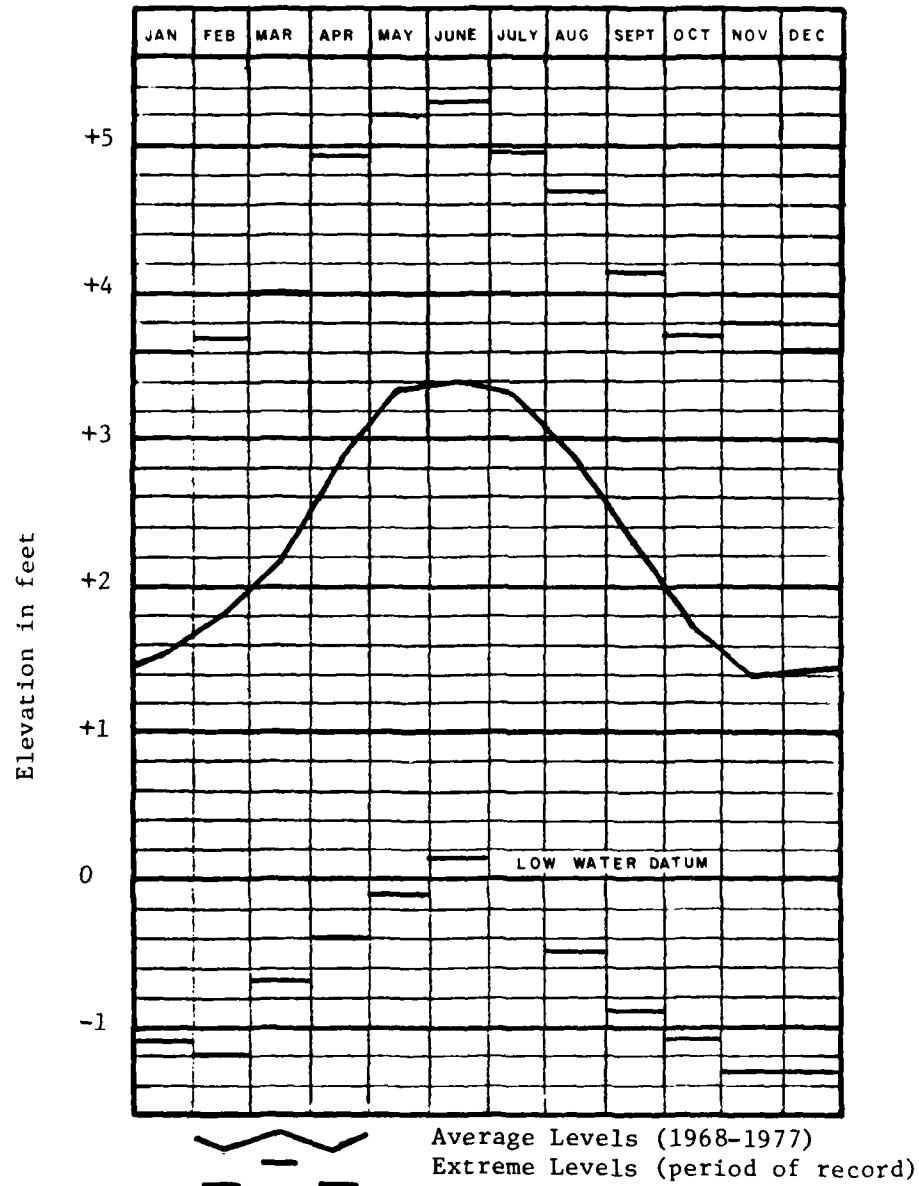
The primary users of the harbor include recreational craft, the Wolfe Island Ferry, occasional tugs and barges and U.S. Coast Guard boats. The drafts of the various boats range from small recreational outboards that draw 1.5 feet to tugs with drafts of 14 feet. A more detailed discussion of each type of user follows.

(1) Recreational Users

Based on the reconnaissance survey, the permanent recreational fleet consists of 145 crafts that utilize five major active marinas in the project area. The permanent recreational fleet has an estimated depreciated value of

Illustration No. 1 (e)

Lake Ontario Hydrograph



Low Water Datum, which is the plane of reference for the levels shown on the above hydrograph, is also the plane of reference for the charted depths. If the lake level is above or below Low Water Datum the existing depths are correspondingly greater or lesser than the charted depths.

Source: National Ocean Survey Chart No. 14802

approximately \$1.8 million. A breakdown of the number of the various types of craft, by length, appears in Table 8. The average depreciated value of each boat type/length category is presented in Table 9. The depreciated value of the fleet (Table 10) was derived by applying the values shown in the Average Fleet Depreciation Matrix (Table 9) to the number of craft in each category (Table 8). Approximately 800 transient (e.g. cruisers and sailboats in overnight transit) crafts use the facilities during the regular boating season. Table 11 depicts the average fleet draft matrix for various types and lengths of boats.

Table 8 - Cape Vincent Harbor Project Area  
Summary of Permanent Fleet\*

Types of Craft	Less than 16 Feet	16 - 25 Feet	26 - 39 Feet	40 Feet Plus	Total
Outboards	0	35	0	0	35
Sailboats	-	-	-	-	0
Inboards	0	16	1	0	17
Cruisers	0	0	29	3	32
Aux. Sailboats	0	1	8	1	10
In/Outdrive	0	24	24	0	48
House/Pontoon	0	0	3	0	3
Total	0	76	65	4	145

\*Five Active Privately-Owned Marinas That Accommodate Recreational and Other Small Craft are summarized.

Table 9 - Average Fleet Depreciation Matrix

Type of Craft	Less than 16 Ft.	16 - 25 Ft.	26 - 39 Ft.	40 - 64 Ft.
Outboard	1,160	3,180	5,200	6,200
Sailboat	880	3,890	7,890	12,890
Inboard	5,200	8,300	13,530	-
Cruiser	5,200	7,700	24,340	69,500
Aux. Sailboat	1,280	9,500	20,090	58,040
In/Outdrive	3,800	6,180	10,530	-
House/Pontoon	-	3,500	15,500	25,500

Table 10 - Depreciated Total Value Matrix (Permanent Fleet)

Types of Craft	Less than 16 Feet	16 - 25 Feet	26 - 39 Feet	40 Feet Plus	Total
Outboards	0	111,300	-	-	111,300
Sailboats	0	-	-	-	-
Inboards	0	132,800	13,530	-	146,330
Cruisers	0	-	705,860	208,500	914,330
Aux. Sailboats	0	9,500	160,720	58,040	228,260
In/Outdrive	0	148,320	252,720	-	401,040
House/Pontoon	0	-	46,500	-	46,500
Total	0	401,920	1,179,330	266,540	1,847,790

Table 11 - Average Fleet Draft Matrix

Length Types	Less than 16 Feet	16 - 25 Feet	26 - 39 Feet	40 - 64 Feet	65 Feet Plus
Outboard	1.5	1.5	2.0	2.5	-
Inboard/Outdrive	1.5	2.5	3.0	-	-
Inboard	2.0	2.5	3.0	-	-
Sailboat	2.5	4.0	5.0	6.0	-
Aux. Sailboat	2.5	4.0	5.0	6.0	-
Cruiser	3.0	3.5	4.0	5.5	6.0
House/Pontoon	-	3.0	4.0	5.0	-
Other	2.0	3.0	4.0	5.0	6.0

Source: Buffalo District, Corps of Engineers

The recreational boating season usually extends from April to September. The mooring fees average \$600 per slip per year, depending on the length of the boat. Storage fees range from \$1.35 to \$2.25 per square foot.

## (2) Major Commercial Users

Wolfe Island Ferry. There are two categories of commercial vessels which use the Cape Vincent Harbor. The Wolfe Island Ferry consists of two automobile ferries that connect Cape Vincent, NY, with Kingston, Ontario. One vessel runs from Cape Vincent across the St. Lawrence River to Wolfe Island; the other runs from the opposite (north) side of Wolfe Island to Kingston, Ontario. The two ferries are owned and operated by Horne Ferry Ltd., a privately owned Canadian corporation. The operation of the two vessels is co-ordinated so the one-way trip from Cape Vincent to Kingston takes about 1-1/4 hours.

During 1980, the Wolfe Island Ferry transported approximately 18,000 cars in 1,800 trips, an average of 10 cars per trip. The ferries operate from mid-May to late October. When the ferries do not operate, the only available alternative automobile route between Cape Vincent and Kingston, Ontario, is via the Thousand Island Bridge; this involves a one-way 62-mile trip.

## (3) Other Commercial Vessels

Cape Vincent Harbor basically consists of a breakwater protecting the otherwise exposed south shore of the St. Lawrence River at the village of Cape Vincent, NY. The breakwater was authorized in the River and Harbor Act of 3 March 1899 to provide "a secure mooring place for vessels bound down the river at night and in thick weather, and for those which are storm bound when going up the lakes." (65th Congress, 1st Session, House of Representatives Document No. 304, 30 Jul 1917). Quite clearly, Cape Vincent Harbor was created to provide refuge for commercial vessels entering and leaving Lake Ontario and the St. Lawrence River. It was not created for the purpose of developing Cape Vincent, NY as a major commercial harbor. To date, its primary function has been to provide a secure anchorage for commercial, and now also for recreational, vessels.

Cape Vincent Harbor's current use as a refuge harbor for commercial vessels is limited to barge (tank vessels) operations, primarily to barges transporting petroleum products. This traffic may be classified into two distinct categories. One consists of relatively small barges and their tugs. The barge capacity is about 20,000 barrels and they carry petroleum products from East Coast refineries and tank farms via the New York State Barge Canal and Lake Ontario; also from Lake Erie refineries (Buffalo and Toledo) to St. Lawrence River harbors, principally Ogdensburg, NY. These vessels will anchor at Cape Vincent Harbor upon their return (upriver) trip when weather on Lake Ontario is too severe for safe passage; when they are "weather bound" at Cape Vincent. Since they are empty on their return (upriver) trip, the barges draft only a few feet and their tugs seldom draft as much as 12 feet. Therefore, these vessels may anchor and seek shelter in the 16-foot channel behind Cape Vincent's breakwater.

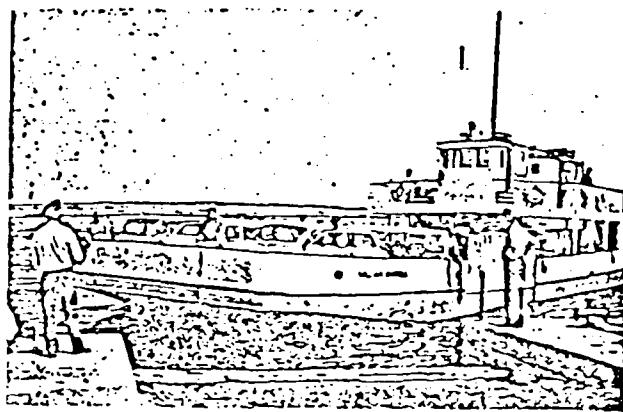
The second category of commercial traffic at Cape Vincent Harbor consists of large barges, capacity of 140,000 barrels, which carry residual fuel oil from Montreal to the Niagara Mohawk Power Corporation's petroleum fueled thermal electric plant at Oswego, NY. Fully loaded, these barges draft 22.5

Illustration No. 2:

Wolfe Island Ferry Operations

(a)

The Only International  
Ferry Crossing The St. Lawrence  
River To & From Canada



FERRY TO CANADA

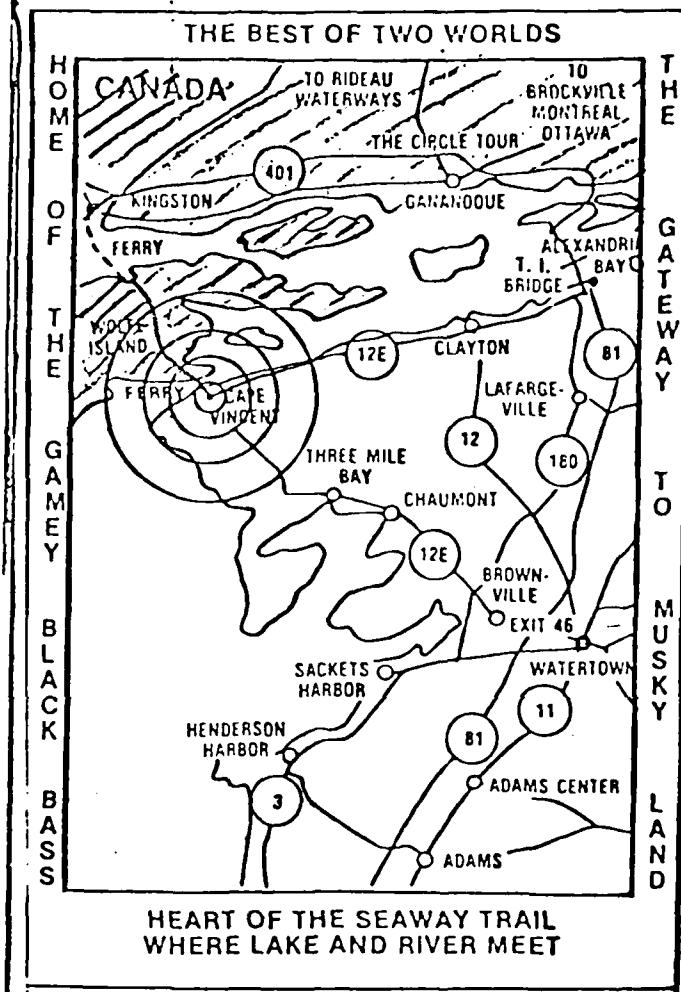
Operating May 15 - October 20, 1980

Depart Wolfe Island	Depart Cape Vincent
• 8:15 AM	• 8:30 AM
9:30	10:00
11:00	11:15
12:15 PM	12:30 PM
1:30	1:45
3:00	3:15
4:15	4:30
5:45	6:00
• 7:00	• 7:30

Denotes trips not run Monday - Thursday during periods May 15 - June 12 & Sept. 15 - Oct. 20.

COINCIDES WITH FREE  
FERRY TO KINGSTON

(b)



feet; their tugs draft approximately 14 feet. As they are fully loaded when they exit from the St. Lawrence River into Lake Ontario, they cannot seek shelter at Cape Vincent Harbor when lake weather is too severe for safe passage; their draft substantially exceeds the authorized and maintained depth (16 feet) behind Cape Vincent's breakwater. If "weather bound" upon entering the lake, these vessels are permitted by the St. Lawrence Seaway Development Corporation to anchor behind (east of) Carleton Island, approximately 10 miles downstream from Cape Vincent. While this anchorage is also available to the smaller barges, they seldom use it as they prefer to anchor at the more convenient Cape Vincent Harbor.

(4) The Coast Guard operations include a 16-foot Boston Whaler which is permanently stationed at Cape Vincent. It is housed in a covered shed on the shoreline and moored to a cement wall. Occasionally, a 180-foot buoy tender, drawing 9 feet may dock there. The Coast Guard operations are maintained year-round. There is a five-man crew with a payroll of approximately \$85,000 per annum. Most of the Coast Guard activities involve the protection of life and property especially during periods of inclement weather. Quite often, boats have to be guided into the Cape Vincent harbor during periods of poor visibility. In addition the Coast Guard provides assistance with any groundings near the U.S breakwater due to "featherbed" shoaling.

#### d. Harbor Facilities, Including Shoreline Structures

The shoreline area of Cape Vincent is predominantly developed for recreational purposes. The area is developed residentially and a series of marinas or recreational facilities - both private and public - occupy the shorefront area. Considerable galvanized covered shed storage is available.

At the present time, the riverfront area is substantially developed from the westerly portion of the village to Anchor Marina (See Illustration No. 3). The limiting depths in the berthing areas range from 4 to 10 feet (see project map). Any additional improvements in this area would necessitate redesign of shore facilities thus maximizing the water areas, which could be costly.

##### (1) Existing Harbor Facilities

The following is a tabulation of major shoreline facilities, beginning at the foot of Market Street and proceeding in a northeasterly direction. (Please refer to Illustration No. 4).

- . Cape Vincent Marina, Inc.
- . U.S. Coast Guard Depot
- . U.S. Customs and Immigration
- . Gault's Marina
- . Sportman's Lodge and Marina (Exxon)

- Aubrey's Boating Center (Mobil)
- Village Dock and Ramp
- State of New York Department of Environmental Conservation,  
Fisheries Research Station
- Anchor Marina (now called Mariner's World)

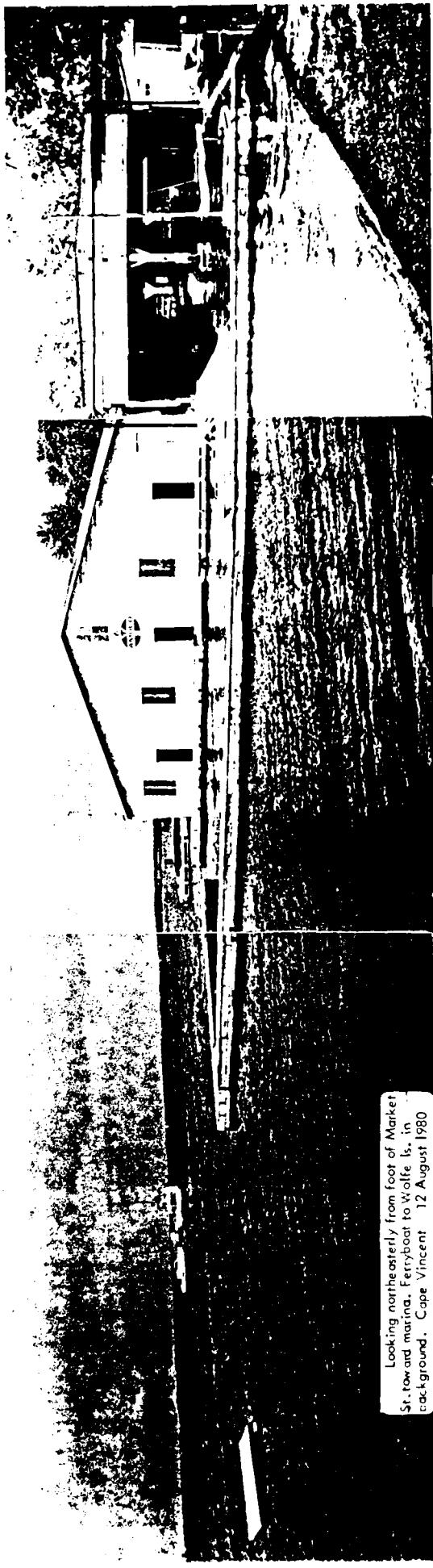
A brief description of several selected facilities is presented below. All of the major facilities are identified in Illustration No. 4. A detailed breakdown of the numbers and types of permanent craft at each of the five major marinas is also presented.

(a) The Cape Vincent Marina is located between Market Street and Point Street on the river. The facility has a small dock (which acts as a breakwater) constructed of a wood frame on wood pilings with wood floor boards. This forms the enclosure for the marina and it is in fair condition. There is gasoline storage at two boat shelters, as well as gasoline diesel pumps at the building off Point Street. (See Illustration No. 3).

The marina has berths for 28 crafts, and was 71 percent occupied at the time of this survey (August 1980). A breakdown of the number of craft by type and length is presented in Table 12.

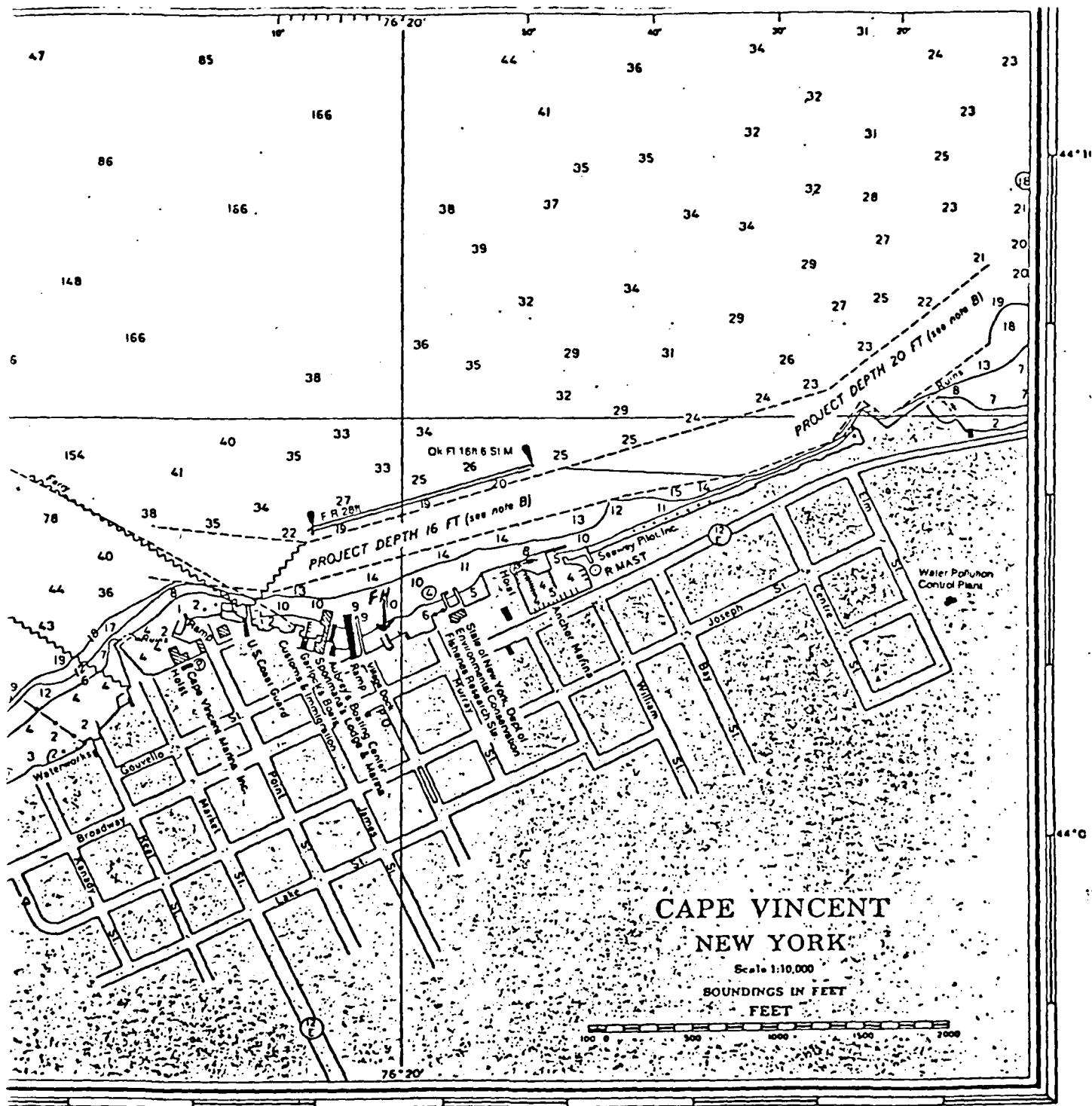
Table 12 - Facility: Cape Vincent Marina, Inc.  
Harbor: Cape Vincent, NY  
Number of Craft by Type and Length

Type of Craft	Less than 16 Feet	16 - 25 Feet	26 - 39 Feet	40 - 64 Feet	Total
Outboards	0	3	0	0	3
Sailboats	0	0	0	0	0
Inboards	0	1	0	0	1
Cruisers	0	0	0	0	0
Aux. Sailboats	0	0	0	0	0
Inboard/Outdrive	0	14	2	0	16
House/Pontoon	0	0	0	0	0
Total	0	18	2	0	20



Looking northeasterly from foot of Marker  
St. row and marina. Ferryboat to Wolfe Is. in  
background. Cape Vincent  
12 August 1980

Illustration No. 4 - A more detailed map of Cape Vincent Village



\*b. The Buccaneer Motel Dock has a small slip constructed of wood and similar to the Cape Vincent Marina. This is in usable condition and is maintained by the owner of the motel. If there is ice flow converse to the general flow of the river, it could cause considerable damage to the small dock. The water depth is shallow, 2 to 3 feet. This facility does not appear on the project map, but it is located at the foot of Point Street between the New York Coast Guard facilities and Cape Vincent Marina.

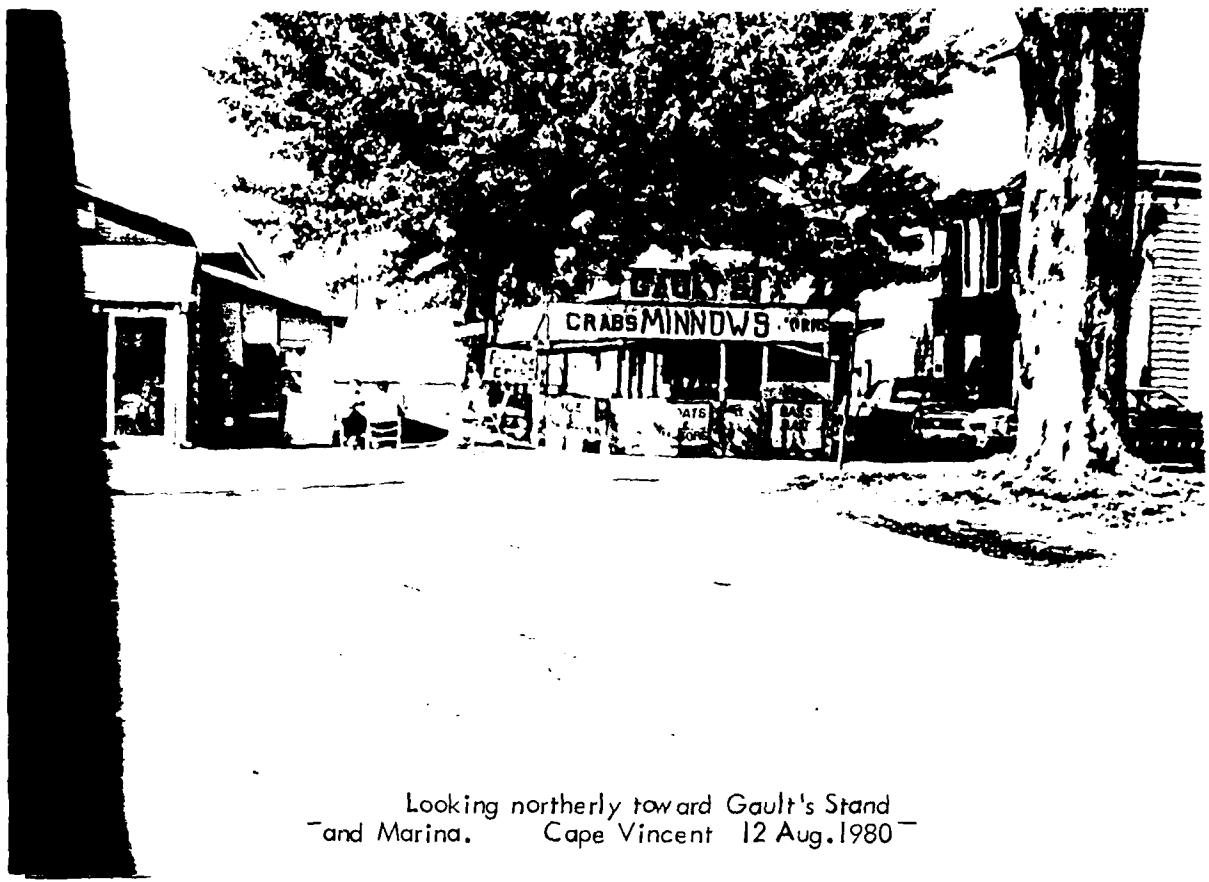
c. The United States Coast Guard Depot, on the water between Point Street and James Street, is in excellent repair. There are docking facilities for the Coast Guard rescue boats and the depot has a large repair-storage structure and office built adjacent to the dock, extending about 75 feet into the water. It is our understanding that there has been considerable topping on the dock, with parts of the structure being awash during severe storms. This depot has a finished deck of concrete and is in excellent repair. If there was ice action against the dock in the past, there is no apparent adverse structural evidence.

\*d. The U.S. Customs and Immigration Office consists of a small building with docking facilities. The ferry boats (between Wolfe Island, Ontario and the United States) dock here. It is in need of general up-grading but adequate for the immediate future.

e. Gault's Marina, next to the U.S. Customs area, consists of a number of old wooden structures. There is a small bait shop providing crabs and minnows and other bait items to fishermen; the small buildings are in fair condition. The marina is to the rear of the small buildings and extends into the protected area of the river. The structures are protected by the breakwater from storm and ice (movement) damage. The marina has six berths which are fully occupied. A breakdown of the number of type of craft, as well as their depreciated value appear in Table 13.

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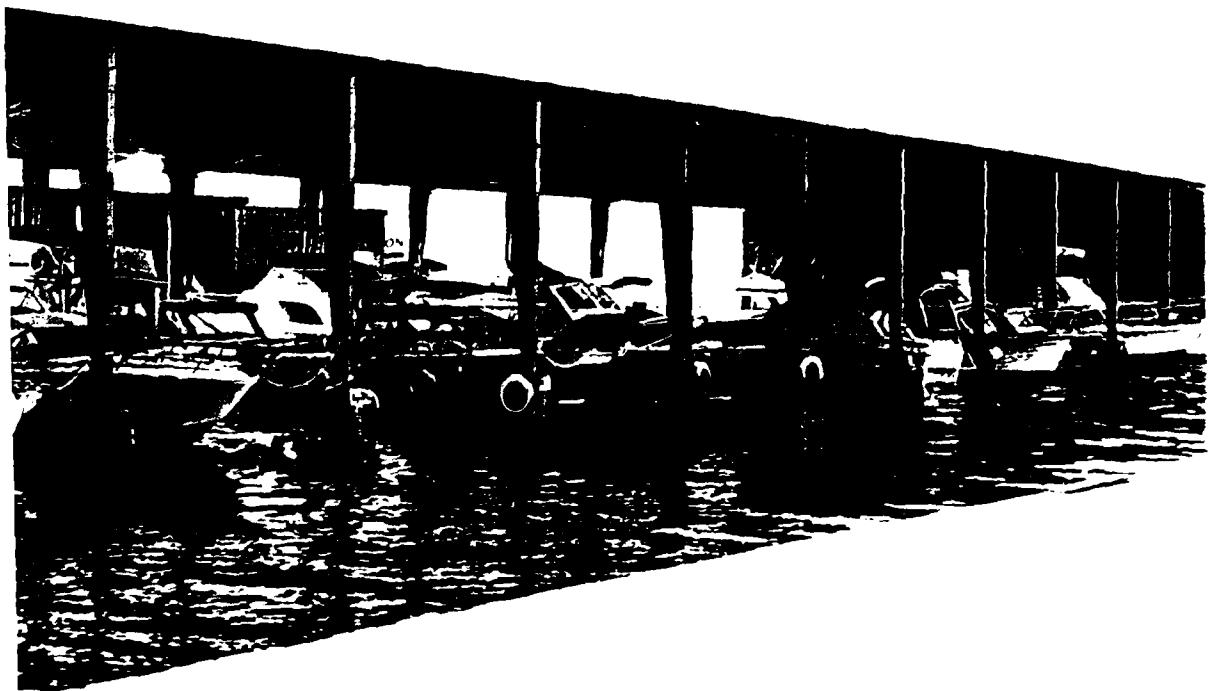
\* A description of these facilities is included for informational purposes only, since they are not primarily engaged in providing docking services, etc. They have not been included in the Benefit-Cost analysis.



Looking northerly toward Gault's Stand  
- and Marina. Cape Vincent 12 Aug. 1980 -

Illustration No. 5

Illustration No. 6



Covered storage facility immed. west of  
-village dock, foot of Esseltyne Street.  
Cape Vincent 12 August 1980

Table 13 - Facility: Gault's Marina Harbor: Cape Vincent, NY  
Number of Craft by Type and Length

Type of Craft	Less than 16 Feet	16 - 25 Feet	26 - 39 Feet	40 Feet Plus	Total
Outboards	0	2	0	0	2
Sailboats	0	0	0	0	0
Inboards	0	4	0	0	4
Cruisers	0	0	0	0	0
Aux. Sailboats	0	0	0	0	0
In/Outboards	0	0	0	0	0
House/Pontoon	0	0	0	0	0
Total	0	6	0	0	6

f. Sportsman's Lodge and Marina, is located in an area adjacent to what was formerly Garlock's Boats (see Illustration No. 7). The facilities include 12 berths and a launch hoist. There is an Exxon pump to provide gas service to the boats, as well as a bait shop, and a restaurant that is open year-round.

Sportsman's Lodge has 12 berths, and is 100 percent occupied. Table 14 provides details of the number and size of craft.

Table 14 - Facility: Sportsman's Marina Harbor: Cape Vincent, NY  
Number of Craft by Type and Length

Type of Craft	Less than 16 Feet	16 - 25 Feet	26 - 39 Feet	40 Feet Plus	Total
Outboards	0	2	0	0	2
Sailboats	0	0	0	0	0
Inboards	0	11	1	0	12
Cruisers	0	0	0	0	0
Aux. Sailboats	0	0	0	0	0
In/Outboards	0	0	0	0	0
House/Pontoon	0	0	0	0	0
Total	0	11	1	0	12

g. Aubrey's Boating Center (Mobil Oil), consists of slips and office area. It is built with a steel frame and a roofed area over the slips of corrugated metal and asphalt coating. There are gasoline tanks (vented) and gasoline (diesel) pumps. The facility has full electrical service and provides protection for 30 boats having drafts of up to 6 feet. (See Table 15 for details about the numbers and types of craft).

Table 15 - Facility: Aubrey's Boating Center  
Harbor: Cape Vincent, NY  
Number of Craft by Type and Length

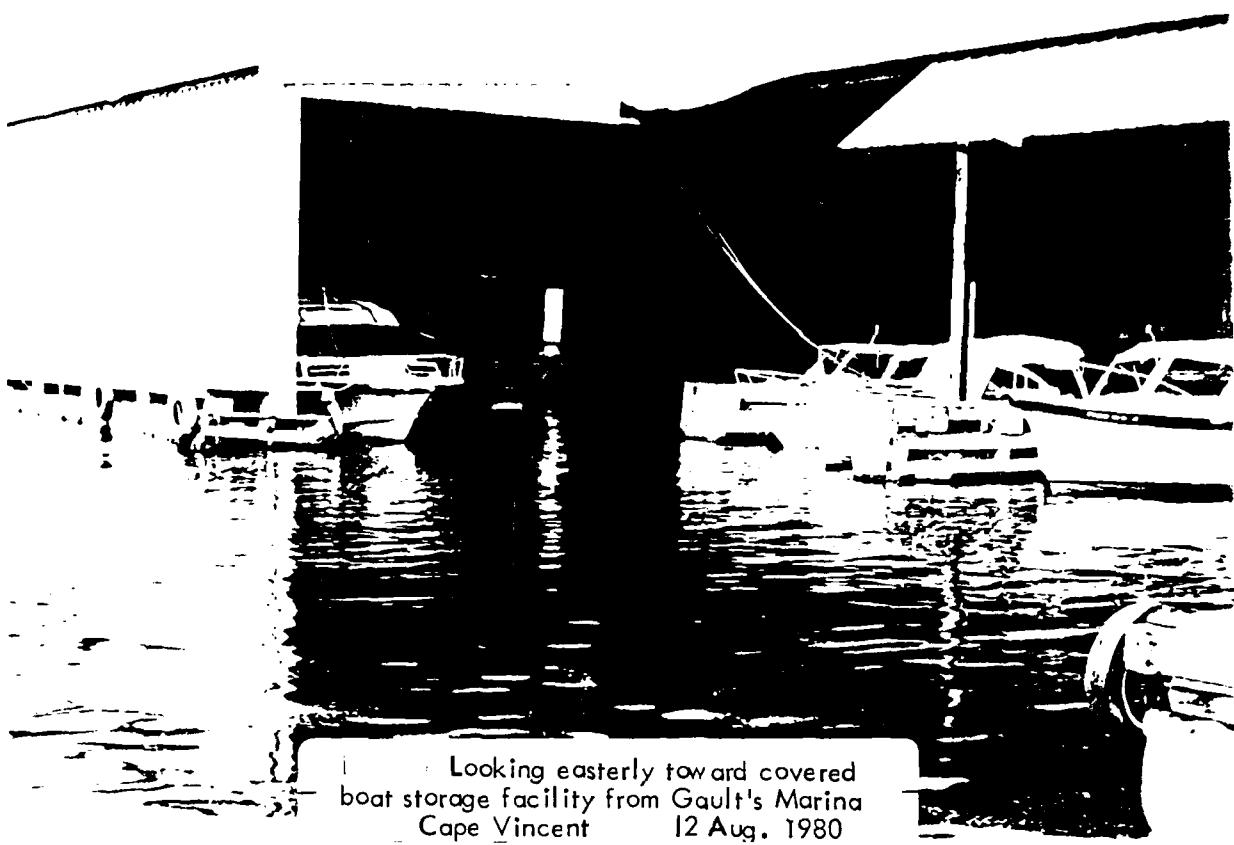
Type of Craft	Less than 16 Feet	16 - 25 Feet	26 - 39 Feet	40 Feet Plus	Total
Outboards	0	0	0	0	0
Sailboats	0	0	0	0	0
Inboards	0	0	0	0	0
Cruisers	0	0	0	0	0
Aux. Sailboats	0	0	0	0	0
In/Outboards	0	10	22	0	32
House/Pontoon	0	0	0	0	0
Total	0	10	22	0	32

\*h. The Village Dock is in good repair. There is a launching ramp, also is in good condition, between the dock and Aubrey's Boating Center. The dock is the usual wood frame on piles with creosoted wood boardwalk. The general condition of the dock is fair to good.

\*i. The New York State Fisheries Research Station is in good condition. The structure is well built, the bracings and boardwalk are in excellent condition. In general it is being well maintained. The station hatches several species of fish that are found in the lake/river area.

\*j. The Fish Hatchery is a reconverted old building with excellent equipment and it provides substantial economic and recreational benefits to the whole area. There are two small docks at the rear of the building, and these docks enclose a small water area with good depth (about 10 feet). The docking facilities are in generally good condition. This location is the site of the abandoned commercial fishing landing area, marked "FH" in Illustration No. 3.

k. Mariner's World (formerly the Anchor Marina) is the largest facility in the Cape Vincent area (52 percent of the Cape Vincent permanent fleet), but is not in the best repair. The marina harbor is nicely enclosed and well



Looking easterly toward covered  
boat storage facility from Gault's Marina  
Cape Vincent 12 Aug. 1980

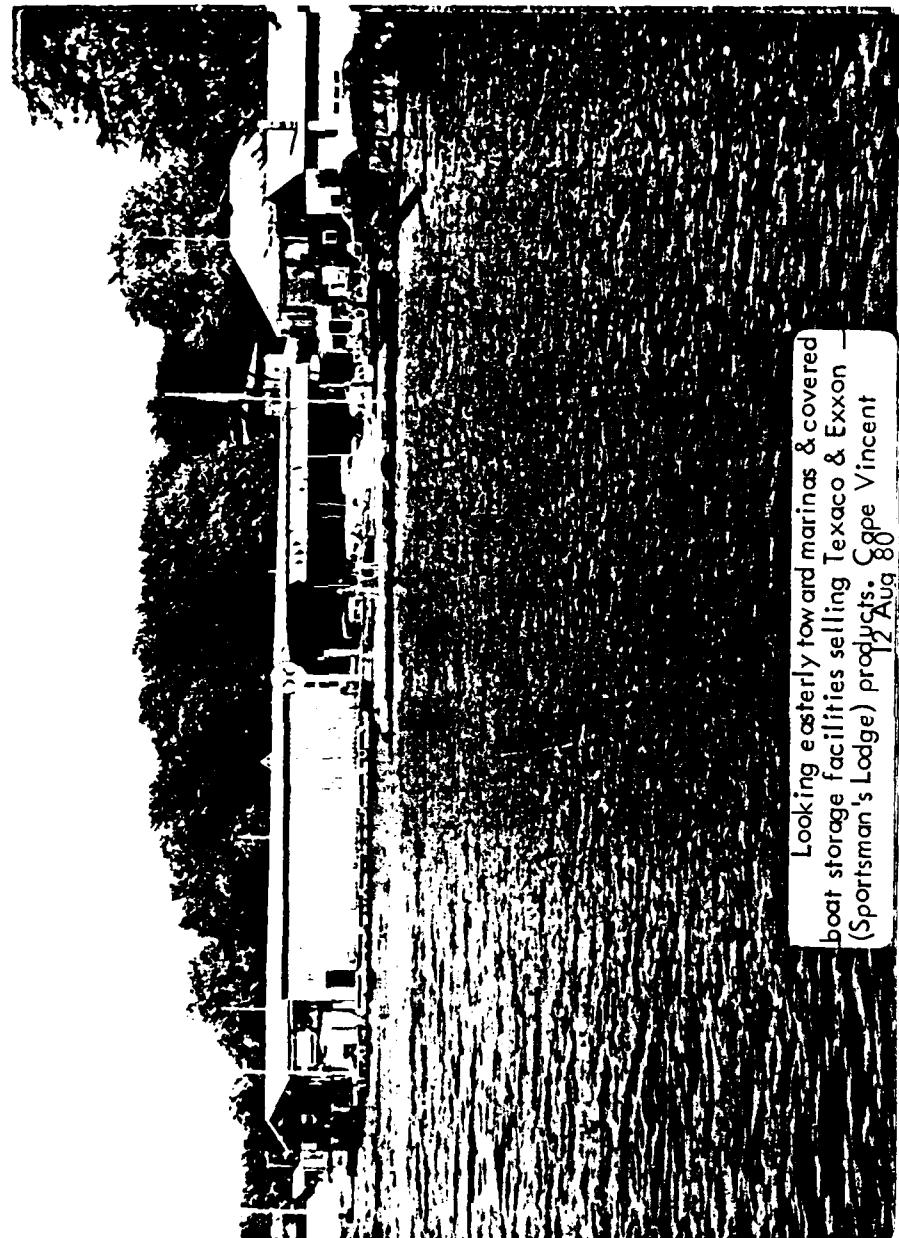
Illustration No. 7

ILLUSTRATION No. 8



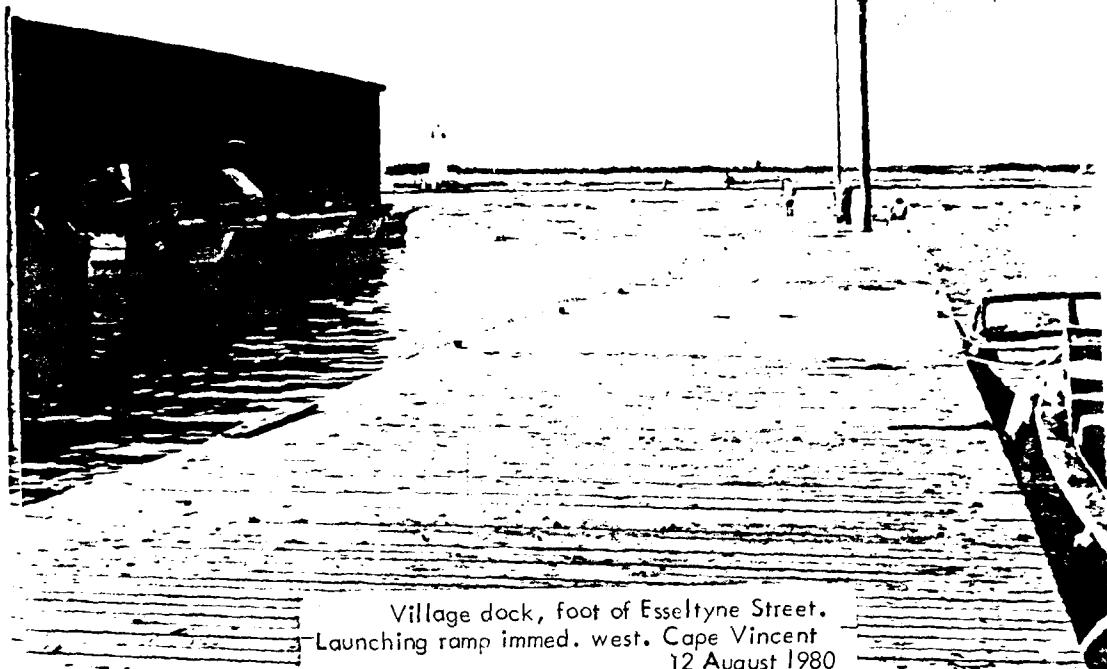
Looking northerly toward Gault's  
Marina. Cape Vincent

12 August 1980



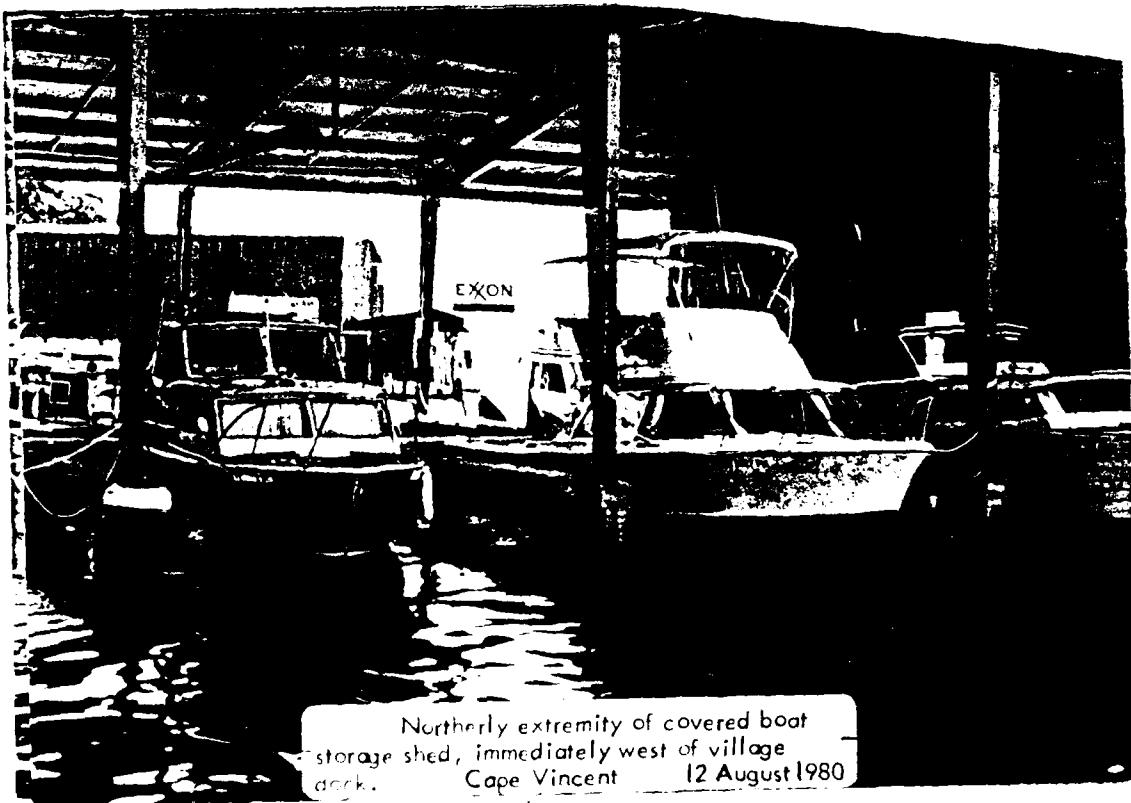
Looking easterly toward marinas & covered  
boat storage facilities selling Texaco & Exxon  
(Sportsman's Lodge) products. 2 Aug 88  
Cape Vincent

Illustration No. 9

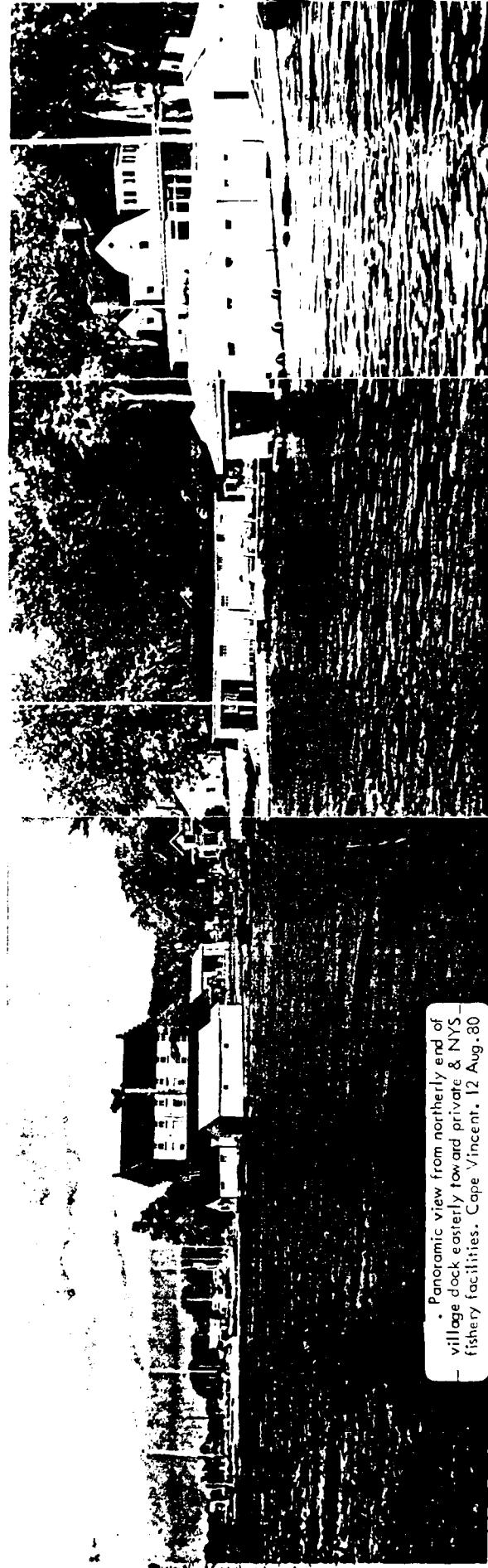


Village dock, foot of Esseltyne Street.  
Launching ramp immed. west. Cape Vincent  
12 August 1980

Illustration No. 10



Northerly extremity of covered boat  
storage shed, immediately west of village  
dock. Cape Vincent 12 August 1980



• Panoramic view from northerly end of  
village dock easterly toward private & NYS  
fishery facilities. Cape Vincent. 12 Aug. 80

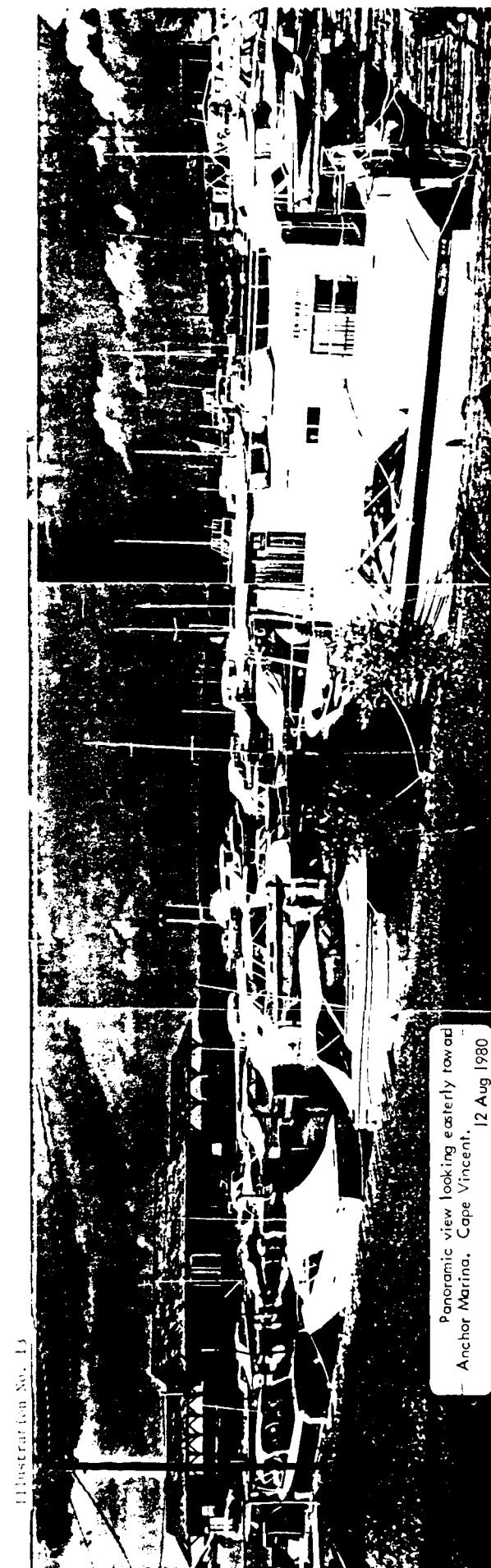
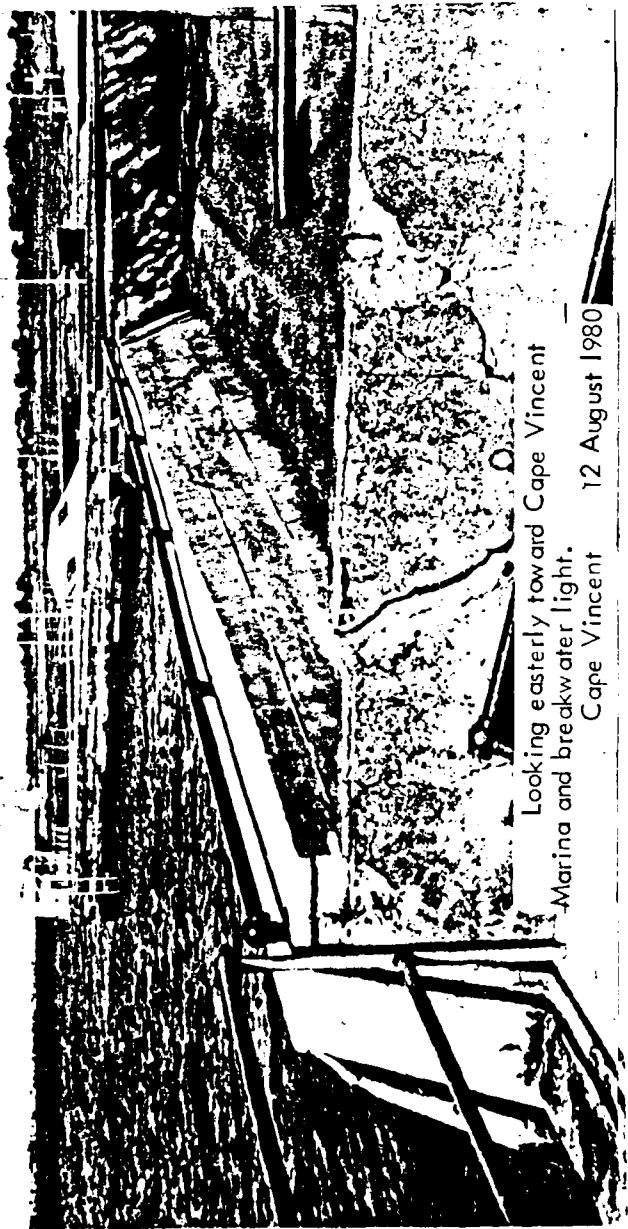


Illustration No. 13

Panoramic view looking easterly toward  
Anchor Marina, Cape Vincent, 12 Aug 1980

Illustration No. 12



protected. The main service building runs parallel with Boardway (a major shoreline street). The service building is built of wood with a shingled hip roof.

This facility has berths for 85 boats and was 88 percent occupied at the time of the reconnaissance survey. (Table 16 provides details of the numbers and types of craft.

Table 16 - Facility: Mariner's World Marina (formerly Anchor Marina)  
Harbor: Cape Vincent, NY  
Number of Craft by Type and Length

Type of Craft	: Less than 16 Feet	: 16 - 25 Feet	: 26 - 39 Feet	: 40 Feet Plus	: Total
Outboards	: 0	: 30	: 0	: 0	: 30
Sailboats	: 0	: 0	: 0	: 0	: 0
Inboards	: 0	: 0	: 0	: 0	: 0
Cruisers	: 0	: 0	: 29	: 3	: 32
Aux. Sailboats	: 0	: 1	: 8	: 1	: 10
In/Outboards	: 0	: 0	: 0	: 0	: 0
House/Pontoon	: 0	: 0	: 3	: 0	: 3
Total	: 0	: 31	: 40	: 4	: 75

A summary of the five major marina facilities appears in Table 17.

Table 17 - Cape Vincent Harbor Recreational Boating Matrix Summary, By Facility  
(Project Area), August 1980

Boating Facility/ Marina Name	Pier	Anchor	Moorings	Docks	Berths	Ramps	Lift Tracks	Other	Launch Hoists:
1. Mariner's World (Formerly - Anchor Marina)	1	-	6**	85	-	-	-	-	1
2. Cape Vincent Marina	3	-	6*	28	1	-	-	-	1
3. Aubrey's Boating Center	-	-	4**	32	1	-	-	-	2
4. Sportsman's Marina	12	-	-	12	-	-	-	-	1
5. Gault's Marina	-	-	-	3*	6	-	-	-	-
Total	16	-	98	163	1	-	-	-	5

Aggregate Marina Shoreline : 1,1028 Feet (Approximately)  
Approximate Annual Revenue (Services): \$114,850.

Overall Occupancy Rate: 89 percent

N/A - Not Applicable

\* These docks are classified as Finger Docks, with 2 slips per dock.

\*\*These are larger docks.

e. Obstructions and Hazards to Continued Operation of Corps Facilities:  
A Summary.

A study of the hydrograph' charts of the National Ocean Survey and of the Corps of Engineers reveals no natural or man-made restrictions which would deny access by boating to marina and other facilities. As expected, the depths are progressively more shallow as the shoreline is approached, but this does not create any hazards to current harbor users.

There are no bridges or other restrictions that give rise to clearance problems.

The principal problem at Cape Vincent Harbor is the deteriorated condition of the breakwater. It shows evidence of severe deterioration of the concrete cap on the superstructure. Past reports indicate that the existing timber crib is considered to be in excellent repair. The majority of the above water sections, however, are in need of immediate, major repair. These sections are considered to be hazardous and pose a threat to navigation and pedestrian traffic when using the breakwater as a mooring facility. Severe spalling and undermining of the concrete superstructure show signs of rapid decay due to exposure and settling. Exposed concrete blocks, particularly on the river side, offer little or no protection; if not repaired immediately, continued deterioration will cause the eventual collapse of these blocks leaving the cribbing exposed, thus allowing for further, more serious deterioration. Left uncorrected, the breakwater would deteriorate to the point where it would no longer provide a secure anchorage; further, the partially submerged crib would pose an extremely dangerous navigation hazard.

5. HISTORY OF PROJECT MAINTENANCE AND REHABILITATION COSTS

Cape Vincent Harbor was last dredged in 1945; since then there has been no need to dredge the harbor as there has been no significant shoaling. Between 1950 and 1979 a total of \$34,000 (current dollars) was expended in maintaining the harbor. Nearly all of this was for periodic inspection and condition surveys, all of which indicated the same result: no significant shoaling. Given the lack of shoaling in the past 35 years, there is no foreseeable need to dredge the harbor.

6. FUTURE HARBOR USE, 1980 - 1990

The purpose of this section is to present a short-term general forecast of harbor use. Short-term forecasts for no less than 10 years are designed to show general trends of harbor use at the village of Cape Vincent.

a. Recreational Boating Use.

By 1990, it is estimated that there will be an aggregate increase of approximately 10 percent in recreational boating activities. This 1 percent per annum increase over the next 10 years is derived on the basis of a projected increase of .6 percent per annum in the number of fishing licenses

to be issued in the county in the next 5 years.<sup>1</sup> Since the State Department of Environmental Conservation estimates that only 61 percent of all the fishermen are licensed, the total increase may be well over the .6 percent figure. However, inasmuch as the number of recreational craft will not necessarily increase in direct proportion with the number of licenses issued (there are about two to three anglers to each boat), an estimate of 1 percent growth per annum in the number of recreational craft seems appropriate.

The marina facilities are currently about 90 percent utilized. At the end of the 10-year period they would have reached full capacity, assuming the 1 percent per annum growth rate. Because there is no further room for expansion in the Federal project area, the full growth potential of the marina boating facilities would have been realized by then. The current strength of the permanent recreational boating fleet is 145 boats. By 1990 it is estimated that the number of crafts should be approximately 160, as shown in Table 20(a).

b. Commercial Users.

Given the very rapid rise of fuel costs recently, particularly within the last year, it is all but impossible to make meaningful predictions of future commercial traffic at Cape Vincent Harbor. Use of the harbor by barges transporting petroleum products appears to be declining significantly. Use of the ferry by tourists, the majority of users, is problematical given high gasoline costs and its effect upon tourism. For these reasons, no growth in commercial users has been projected.

## 7. PRELIMINARY ECONOMIC EVALUATION

This preliminary economic evaluation is based on a Benefit-Cost Analysis prepared for the 50-year economic life of the reconstructed breakwater. The economic life extends from 1981-2031. This section of the report is organized into three major parts: Identification and Quantification of Benefits; Identification of Costs; and the Benefit-Cost Analysis.

a. Identification and Quantification of Benefits.

The economic benefits that accrue as a result of the implementation of the project consists of recreational and commercial navigation benefits. While no precise method exists for the calculation of recreational navigation benefits, the methodology used follows that presented in EM 1120-2-113. The methodology for estimating commercial navigation benefits, in this case benefits obtained from continued operation of the ferry, follows the general methodological standards prescribed in Procedures and Standards.

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<sup>1</sup> New York Sea Grant Program, State University of New York College at Brockport, "Projected Economic Impact and Boat Launching Needs of a Mature Salmonid Sports Fishing for the Western New York Lake Ontario Shoreline," March 1979.

(1) Estimation of Maximum Potential Recreational Boating Benefits.

As an initial step in estimating recreational boating benefits, the total monetary value of the annual recreational boating experience accruing to boat owners and operators was determined. This was done by applying the average fleet depreciation matrix (Table 9) to the 145 boats that constitute the permanent recreational boating fleet to obtain the total depreciated value of the fleet (Table 10). The rates of return presented in Table 18 were then applied to the total estimated depreciated value (Table 10) to determine the estimated value of the annual recreational boating experience, in this case \$164,500 (Table 19). This table presents the annual value by type and length of craft in the Cape Vincent recreational boating fleet, including an allowance of four vessels to capture benefits from transient vessels. This value, \$164,500, represents the maximum value of the potential recreational boating damages which could be prevented given implementation of the project; thus it represents the maximum value of potential recreational boating benefits attributable to the project.

Table 18 - Rate-of-Return Schedule

Type of Craft	:	Rate-of-Return (Percent)*
Outboard	:	12.5
Sailboat	:	10.0
Inboard	:	10.0
Cruiser	:	7.5
Aux. Sailboat	:	7.5
Inboard/Outdrive	:	12.5
House/Pontoon	:	10.0

Note: Rates of Return are median values as presented in EM 1120-2-113 except those for Inboard/Outdrive and House/Pontoon which have been developed by the Buffalo District Office.

\* Rate applies to all lengths

Table 19 - Annual Value of the Recreational Boating Experience  
Cape Vincent Harbor, NY (\$1980)

Type of Craft	:16 - 25 Feet	:26 - 39 Feet	:40 - 64 Feet	Total
Outboards	: 13,910	: 0	: 0	: 13,910
Inboards	: 13,280	: 1,350	: 0	: 14,630
Cruisers	: 0	: 56,900	: 15,640	: 72,230
Aux. Sailboats	: 710	: 15,070	: 4,350	: 20,130
Inboard/Outdrive	: 14,830	: 25,270	: 0	: 40,100
House/Pontoon	: <u>0</u>	: <u>3,490</u>	: <u>0</u>	: <u>3,490</u>
Total	: 42,730	: 101,770	: 19,990	: 164,490

Note: The Total Recreational Navigation Benefits Matrix is derived by multiplying the appropriate rate shown in the Rate-of-Return Matrix by the Total Value Matrices and summing across categories. With respect to the Other (Transient) type of craft benefits, the basis for this entry is the 800 boat/days generated in the Cape Vincent project area by transient craft divided by the 210-day boating season. The 4-Boat Figure derived herein assumes that two boats are Cruisers, 26-39 feet, and two other boats are Auxiliary Sailboats, 26-39 feet.

(2) Harbor-of-Refuge Benefits for Recreational Boating.

No harbor-of-refuge benefits for recreational boating have been attributed to the project because of the abundance of nearby anchorages for recreational craft.

b. Estimation of Commercial Navigation Benefits.

The estimation of commercial navigation benefits accruing to the project includes benefits obtained from continuation of the Wolfe Island Ferry and, possibly, from use of the harbor as a refuge for commercial navigation vessels.

(1) Continuation of the Wolfe Island Ferry.

Benefits which accrue to the project from continued operation of the Wolfe Island Ferry consist of detour costs avoided and recreational travel benefits accruing to travelers using the ferry for recreational purposes. Detour costs avoided assume that some proportion of the 900 ferry trips annually originating on the American (Cape Vincent) side of the international boundary are necessary trips made by local residents. Since these are local and necessary trips, a detour would be made should the ferry cease to operate. Given a lack of data on the proportion of trips originating with

Cape Vincent residents, two scenarios have been assumed: Scenario A, with 100 local (detour) and 800 tourist (recreational travel) trips; and Scenario B, with 225 local (detour) and 675 tourist (recreational travel) trips. Since the local trips represent detours, they are entered as two-way (round) trips. Tourist (recreational travel) trips are one-way trips; essentially they are trips by tourists who take the ferry primarily as a recreational experience. Under both scenarios 10 autos are assumed per ferry trip; this is the average number of cars per ferry trip in 1980.

Both local (detour) and tourist (recreational travel) trips involve a variable transportation cost and an opportunity cost of time. Variable automobile transportation costs are estimated at \$.145 per mile. The opportunity cost of time is assumed to be \$5.00 each per hour for automobile drivers and their passengers (local residents) while making a local (detour) trip. The opportunity costs of time for tourists (recreational travel) trips is assumed to be equal to 25 percent of the \$5.00 per hour opportunity cost of time of local residents, or \$1.25 per hour ( $\$5.00 \times .25 = \$1.25$  per hour). The length of the detour trip via the Thousand Island Bridge is 62 miles and it is estimated to require 1.25 hours per one-way trip. The estimated time of a one-way recreational ferry ride, including the time spent driving across Wolfe Island and the time on the second ferry, is 1.25 hours.

Benefits for local (detour) and tourist (recreational travel) trips have been estimated separately for: (1) vehicles and their driver; and (2) passengers, with one adult passenger assumed per car. These benefits have been summed to produce two estimates of maximum potential commercial navigation (ferry) damages that could be prevented by implementation of the plan. The resulting damages are presented in Table 20. Under Scenario A, 100 local (detour) ferry trips and 800 tourist (recreational) trips, maximum potential commercial navigation damages prevented amount to \$69,700 (Table 20). Under Scenario B, 225 local (detour) ferry trips and 675 tourist (recreational) ferry trips, maximum potential commercial navigation damages prevented amount to \$72,500. Since these damages would be prevented by implementation of the plan, they accrue to the project as benefits. Clearly, the value of maximum potential benefits accruing to the project from continued operation of the ferry is not significantly affected by the allocation of trips between local (detour) and tourist (recreational travel) trips.

Table 20 - Estimation of Commercial Navigation  
(Automobile Ferry) Benefits (\$1981)

I. Scenario A<sup>1</sup> - 100 detour and 800 recreational (tourist) trips per season

	: Autos	: Passengers	7	: Total
A. Recreational Travel Benefits	:	:	:	:
1. Variable transportation costs	: 28,960	2	6,000	: 34,960
2. Opportunity costs of time	: <u>12,500</u>	3	<u>12,500</u>	: <u>25,000</u>
3. Recreational travel benefits	: 41,460	:	18,500	: 59,960
B. Local Travel (Detour) Benefits	:	:	:	:
1. Variable transportation costs	: 18,480	4	0	: 18,480
2. Opportunity costs of time	: <u>12,500</u>	5	<u>12,500</u>	: <u>25,000</u>
3. Subtotal	: 30,980	:	12,500	: 43,480
4. Total ferry trip costs	: <u>19,740</u>	6	<u>14,000</u>	: <u>33,740</u>
5. Local travel benefits (B.3 - B.4)	: 11,240	:	- 1,500	: 9,740
C. Total Commercial Navigation (Auto- mobile Ferry) Benefits (A3 + B5)	: 52,700	:	17,000	: 69,700

II. Scenario B<sup>1</sup> - 225 detour and 675 recreational (tourist) trips per season

	: Autos	: Passengers	7	: Total
A. Recreational Travel Benefits	:	:	:	:
1. Variable transportation costs	: 24,435	2	5,062	: 29,497
2. Opportunity costs of time	: <u>10,546</u>	3	<u>10,546</u>	: <u>21,092</u>
3. Recreational travel benefits	: 34,981	:	15,608	: 50,589
B. Local Travel (Detour) Benefits	:	:	:	:
1. Variable transportation costs	: 41,580	4	0	: 41,580
2. Opportunity costs of time	: <u>28,125</u>	5	<u>28,125</u>	: <u>56,250</u>
3. Subtotal	: 69,705	:	28,125	: 97,830
4. Total ferry trip costs	: <u>44,415</u>	6	<u>31,500</u>	: <u>75,915</u>
5. Local travel benefits (B.3 - B.4)	: 25,290	:	- 3,375	: 21,915
C. Total Commercial Navigation (Auto- mobile Ferry) Benefits (A3 + B5)	: 60,271	:	12,233	: 72,504

Note: 1. Based on 900 ferry trips per year (10 cars per trip with each car carrying two adults as allocated indicated in Scenarios A and B.

2. Based upon a 62 mile detour by road, variable automobile operating costs of \$.145 per mile and a \$2.75 ferry fare per car.

3. Based on an opportunity cost of time for recreational travel equal to 25 percent of the average hourly wage rate of \$5.00 per hour.

4. Based upon a 62 mile detour by road, variable automobile operating costs of \$.145 per mile and a Thousand Island Bridge Toll (commuter rate) of \$.25 per car.

5. Based on an assumed average wage rate of \$5.00 per hour and a 2.5 hour round trip.

6. Based upon a one-way ferry fare of \$2.75.

7. Assumes one adult passenger with a one-way ferry fare of \$.75 per person.

## (2) Harbor-of-Refuge Benefits for Commercial Craft

No benefits have been attributed to the project from the use of the harbor as a refuge for commercial navigation, even though commercial vessels presently use the harbor for this purpose. The reason for this is the availability of the nearby secure anchorage behind (east or downstream) of Carleton Island. While the approximate 10-mile trip from that anchorage to Cape Vincent might produce some commercial navigation benefits, the amount is likely to be so small as to be insignificant.

## (3) Estimation of Total Navigation Benefits.

The maximum potential value of total navigation benefits attributable to the project is the sum of the maximum potential recreational boating benefits (\$164,500 in Table 19), and the maximum potential commercial navigation (continuation of the Wolfe Island Ferry) benefits (\$69,700 from Scenario A and \$72,500 from Scenario B - Table 20). Thus total maximum potential benefits attributable to the project are \$234,200 under Scenario A and \$237,000 under Scenario B (Table 21).

Table 21 - Maximum Potential Average Annual Commercial Navigation Damages, Cape Vincent Harbor, New York (\$1980)

Scenario for Commercial Navigation	:	:	:	Total Commercial Navigation Damages
	:	:	:	\$
Scenario A <u>1/</u>	:	164,500	:	69,700
	:		:	234,200
Scenario B <u>2/</u>	:	164,500	:	72,500
	:		:	237,000

1/ 100 local (detour) ferry trips  
800 tourist (recreational) trips

2/ 225 local (detour) ferry trips  
675 tourist (recreational) trips

To the extent that the rebuilding of the breakwater would eliminate the maximum value of potential total navigation damages, the resulting damage prevented are benefits attributable to the project. However, the full value of maximum potential total navigation benefits overstates the actual total benefits attributable to the project as the breakwater is partially effective to date and it will retain some of its effectiveness in the future. The important questions, and they are engineering questions, are: (1) how effective is the breakwater at present; and (2) at what rate will it deteriorate in the future. Based on engineering analysis, it has been estimated that the breakwater is presently 90 percent effective in sheltering Cape Vincent Harbor. It is estimated that the effectiveness of the breakwater will decline by 2 percent per year for the next 25 years, and that, thereafter, it will deteriorate at a rate of 5 percent per year. Finally, it is projected that when the breakwater has deteriorated to 25 percent of its initial (100

percent) effectiveness, it will no longer provide sufficient protection to maintain existing recreational and commercial navigation uses of the harbor. This produces a benefit stream which begins in Project Year One and continues for the economic life of the project, 50 years. The discounted and amortized value of the resulting benefit stream, discounted and amortized at 7-3/8 percent interest rate over 50 years, produces an average annual benefit of \$69,900 under Scenario A (Table 22a) and \$70,400 under Scenario B (Table 22b).

Table 22A - Scenario A <sup>1/</sup>: Average Annual Damages, Benefits and Benefit/Cost Ratio (\$1980)

	: Recreational	: Commercial	: Total
	: Navigation	: Navigation	: Navigation
a. Undiscounted potential average annual damages	: 164,500	: 69,700	: 234,200
b. Accumulated, undiscounted potential damages without the plan <sup>2/</sup>	: 647,100	: 274,200	: 921,300
c. Discounted average annual potential damages without the plan <sup>3/</sup>	: 49,100	: 20,800	: 69,900
d. Discounted average annual damages with the plan <sup>3/</sup>	: 0	: 0	: 0
e. Discounted average annual benefits <sup>3/</sup>	: 49,100	: 20,800	: 69,900
f. Average annual costs	: :	: :	: 70,400
g. Benefit/Cost Ratio	: :	: :	: .99

<sup>1/</sup> Scenario A assumes 100 ferry trips per year originating with local, Cape Vincent residents who have a need to go to Kingston, Ontario; the remaining 800 ferry trips per year are assumed to be tourists.

<sup>2/</sup> See text for derivation of undiscounted damages.

<sup>3/</sup> Assumes a 50-year project life and a preproject interest rate of 7-3/8 percent.

Table 22B - Scenario B <sup>1/</sup>: Average Annual Damages, Benefits and Benefit/Cost Ratio (\$1980)

	Recreational Navigation	Commercial Navigation	Total Navigation
a. Undiscounted potential average annual damages	\$ 164,500	\$ 72,500	\$ 237,000
b. Accumulated, undiscounted potential damages without the plan <sup>2/</sup>	642,700	283,300	926,000
c. Discounted average annual potential damages without the plan <sup>3/</sup>	48,800	21,500	70,300
d. Discounted average annual damages with the plan <sup>3/</sup>	0	0	0
e. Discounted average annual benefits <sup>3/</sup>	48,800	21,500	70,300
f. Average annual costs			\$ 70,400
g. Benefit/Cost Ratio			1.00

<sup>1/</sup> Scenario B assumes 275 ferry trips per year originating with local, Cape Vincent residents who have a need to go to Kingston, Ontario; the remaining 675 ferry trips per year are assumed to be tourists.

<sup>2/</sup> See text for derivation of undiscounted damages.

<sup>3/</sup> Assumes a 50-year project life and a preproject interest rate of 7-3/8 percent.

Source: Table 22.

c. Estimation of Costs.

The project involves major rehabilitation of the superstructure of the breakwater. Illustration 1(c) presents a cross section of the superstructure as constructed in 1917. Illustration 15 presents cross sections as proposed in this project. The total costs for the project are estimated to be \$927,400 (Table 23). Since the project will be completed within 1 year, there are no interest charges. Amortized over a 50-year economic life at the current 7-3/8 percent interest rate, produces an average annual cost of \$70,400.

## Illustration No. 15: Rehabilitation Section of Breakwater, 1980-1981

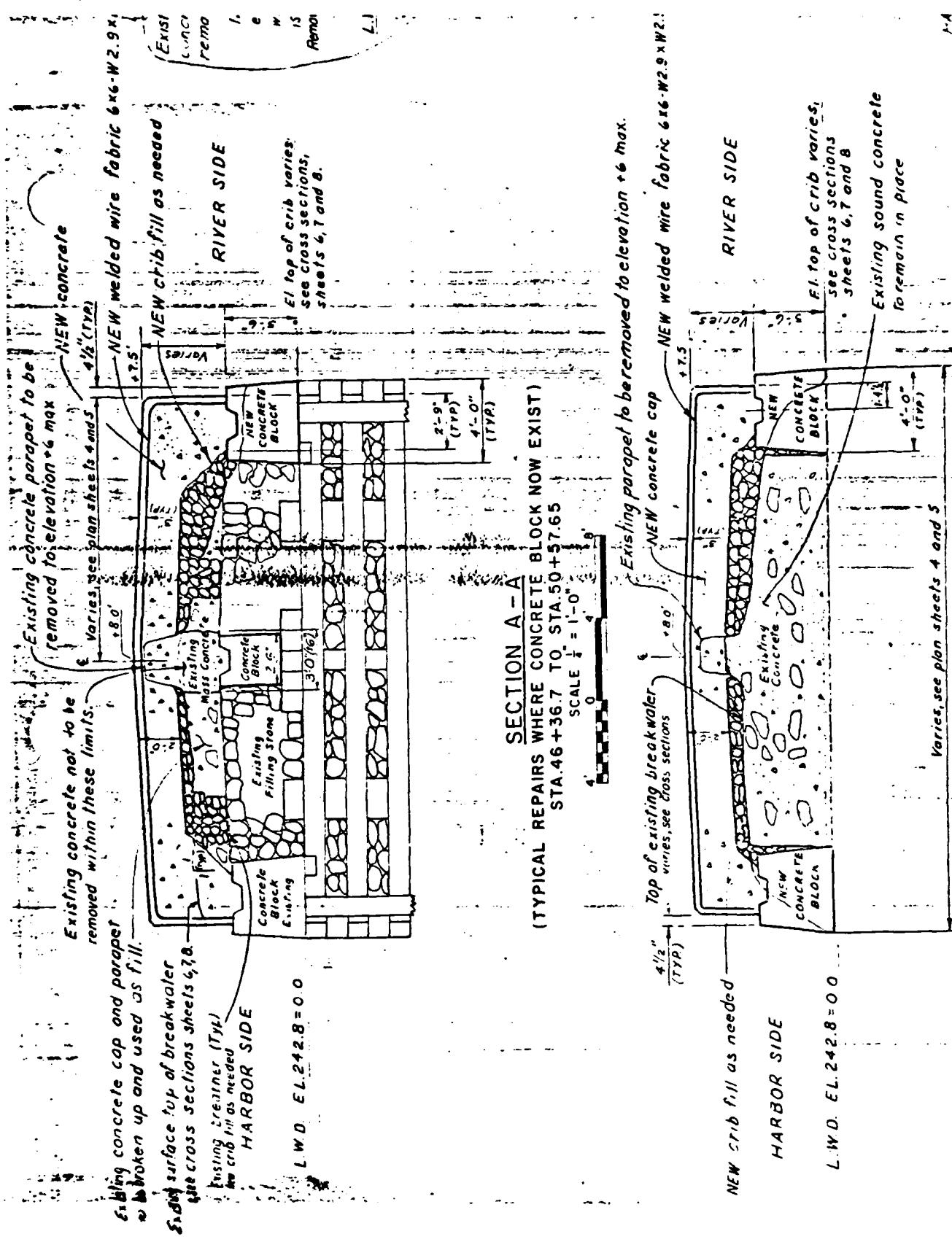


Table 23 - Construction Costs, Major Breakwater Rehabilitation,  
Cape Vincent Harbor, New York (\$1980)

Description	:	Amount
	:	\$
1. Demolition	:	172,000
2. Fill	:	7,600
3. Precast Concrete Blocks	:	174,000
4. Concrete	:	474,000
5. Construction Supplies	:	13,000
6. Temporary Field Office	:	6,300
7. Mobilization and Demobilization	:	<u>50,000</u>
Total	:	927,400

d. Benefit-Cost Analysis.

Average annual benefits, average annual costs and the resulting B/C ratios have been presented in Tables 22a and 22b. As may be seen, benefits are very close under either scenario of commercial navigation benefits. Under Scenario A, average annual project benefits are \$69,900; under Scenario B, average annual project benefits are \$70,400. The total benefits and costs produce a Benefit-Cost ratio of .99 for the project under Scenario A and a ratio of 1.00 under Scenario B.

8. PRELIMINARY ENVIRONMENTAL ASSESSMENT

The concrete cap of this breakwater has deteriorated significantly since its original construction. The crib foundation remains in good condition and is not in need of immediate repair. In October 1979, an Environmental Assessment<sup>1</sup> addressing repair of the breakwater cap was prepared. This document concluded that repair of the cap was preferable to either alternatives - no action or breakwater removal. This assessment adequately addresses the effects of routine breakwater repairs, both in general and specific to that recapping work. General effect of routine maintenance include negative effects on aesthetics, noise, air and water quality, recreation, and commercial navigation, and fish and wildlife.

The presence of construction equipment and associated noise is of negative aesthetic value compared with the project setting. Air quality is adversely affected by dust, odors, and vehicle emissions which are created by

<sup>1</sup> "Cape Vincent Harbor, NY, Breakwater Repair, Environmental Assessment," U.S. Army Engineer District, Buffalo, NY, October 1979.

construction equipment. Unavoidable fuel, oil, grease, and construction material spillages adversely affect water quality. Local recreation activities (mainly boating and fishing) are at least marginally interrupted by repair work. Commercial vessels which moor to the breakwater during rough weather may be prevented from doing so during repair periods. Obviously, the longer term effects of breakwater repair are beneficial to these concerns. Some temporary impacts to fish and wildlife will occur as a result of repair work. Noise and activity of construction work will drive out individuals intolerant of such disturbances. Incidental burial of some biota can occur during surface repairs of breakwaters. All of the above-mentioned negative impacts are of limited magnitude, both temporally and spatially.

#### 9. RECOMMENDATIONS

There is no foreseeable need to dredge Cape Vincent Harbor. Major rehabilitation of the breakwater is necessary and is economically justifiable.